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Art. I.—*The Constitution of Man, considered in Relation to External Objects. By George Combe.* Boston. Carter & Hendee. 1829. 12mo. pp. 310.

In the preface to the American edition of Mr. Combe's work on the constitution of man, it is remarked that this essay treats of education. This term has within a few years been used in a sense somewhat different from its earlier and more usual acceptation. It is not now limited to what may be acquired at a certain age, and which is supposed to be completed when the time for such acquisitions has passed. It is the business of our whole lives; the state in which the mind may be at any moment of its being; and it is continued through all the periods of its existence. Education does not stop; because the mind does not. It cannot be completed, because a vast and interminable future is before, and every moment of its illimitable progress, is producing its effect upon the mind. It is this effect, it is all the effects which all influences have been producing, which is truly education, and this is the comprehensive and wide sense in which this term is beginning to be understood. The means for this end, it has been said, are various. They are in short every thing which affects the mind. They are all of them more or less directly instrumental in the production of what is termed character, the whole state of the being who has been formed by them. It is this view of the subject which has given to education the strong interest which now attaches to it, and he who has not learnt thus much of its history, is unacquainted alike with

its nature, and the demands of the whole public. The present time is remarkable for the zeal which every where prevails for the instruction of the whole community. This zeal is not confined to place. Wherever the mind is, there is this zeal at work to increase by all sorts of means, the intellectual and moral property of nations. It knows no distinctions of ranks. The lower, and we may say the lowest, are within the reach of its influences, and are pressing upwards to the highest. It cannot be strange if such zeal were sometimes without knowledge. It has been remarked, and wisely, as we think, that the tendency of the present system is to make readers instead of thinkers. That the mind which is systematically submitted to it, is in danger of becoming little more than a highway for other men's thoughts, and the individual may come to feel satisfied with the fact that such thoughts have passed over this road. A more serious objection has been urged to the same system of intellectual forcing. It is urged that it pays but little regard to the great subject of establishing sound principles in the mind, and of developing the best affections of our nature, and is satisfied if it gives knowledge. The knowledge, it is said, is of things, of facts, or supposed facts, and the labour is done when the memory is sufficiently encumbered and loaded with them, to meet the views of the system maker. These are serious objections. They have not been advanced carelessly, and from a mere disposition to find fault. They deserve a careful investigation. We shall in the following article, direct our attention to the following inquiries ; what are the purposes of instruction ; and what are its means.

In answering the first question it may be remarked, that the great purpose of instruction is to awaken and to keep alive and active in the individual the consciousness of his intellectual and moral nature, and to fit him for the production of all the good of which he is capable, and to indicate to him the highest happiness of which he is susceptible. A child uses his mind, and experiences pleasure, in the earliest years of his being ; but he may have passed much of his life, and never have deeply and truly been conscious of the nature within him. He may never have turned the mind inward upon itself, and returned from his inquiry glorying in his spiritual nature, and full of the high purpose of preserving it unsullied by vice, and of carrying it onward in all that is most worthy of it. It might seem that the mind itself, from its own constitution, would necessarily lead the individual into the most direct course for making these discoveries.

But this is not the case. We may use all its powers, and profitably, too, both for ourselves and others, and still escape that knowledge of itself which is the surest means of securing to it the deep consideration it deserves. To become thus conscious of the mind's being is to honor it. It becomes an object of interest whenever it is discovered to us, and an equal object of respect. If we would bring into full operation the benevolent principle, we should begin with teaching this truth. Who in the full conviction of his own intellectual nature, can regard with indifference or contempt a being who possesses the same. It may have been dishonored, and folly or crime, or cold neglect of it, may have almost extinguished it. But while it remains, it has within itself the principle of a new life, and there is that around it, and from which it cannot escape, which is ever ready to minister to its restoration, and to open to it the way of an unbroken progress.

Another purpose of all direct influence upon others, especially in the way of instruction, is to develope the powers of that being which our previous labours have discovered to the individual. The process by which this has been attempted has been by tasking the various powers, with a regard to the order of their natural development. The earliest demands made upon the mind, and which are indirect in the infant, and proceeding from the necessity of the case, are on the memory. A vast deal is learnt at this time, without direct instruction, and the facility with which the amount and variety is learnt, is truly surprising. Direct instruction is made to avail itself of what necessity originally demanded, and the memory for many succeeding years continues to be tasked. It may be that this fact in the early history of the individual comes at length to be a serious obstacle to the true progress of the whole mind. Is it not true that many very distinguished men have been remarkable, in early life, for the little attention they have given to the common objects of instruction, and have been habitually dull in performing their tasks. It would seem that the reflective, the entire powers in such instances, had been originally more energetic than the passive ones; that, in other words, these individuals had been more occupied with their own thoughts than with those of others. Along with the exercise of memory, an improved system of teaching makes demands upon the reflective powers also. This is its most important feature. It should never be lost sight of. There are many ultimate facts, which are either not capable of explanation, or get no new interest from explanation.

These are to be early made the property of the mind ; upon all others the mind should be habitually and strongly exerted. It is man's prerogative that he can think. That he can dwell upon, and derive intense delight from the invisible, from that of which the senses can take no note. His own nature, and all its unseen, internal endowments,—the mighty principles which are in active energy around him,—the supreme intelligence of the universe,—the past, with its treasures of thought, and all its imperishable remains,—the present, with its ceaseless action, its designs, and its accomplishments,—the future, with its uncertainty and its promise,—every thing in the wide universe addresses itself to the mind, and calls earnestly upon it to put forth all its powers, and to make all being its possession.

Thirdly. Another and great purpose of this revelation to the individual of the mind's being, and of the powers with which it has been endowed, should be the development, and confirmation of principles. The rule of action in the things of the material physical world are fixed in them, and inhere in their very constitution. They are invariable in their agency as it regards the individual thing, and the thing itself only becomes changed by the direct agency of something external to itself. This is in no sense the case with man. He acts from within upon what surrounds him, and after a manner which he may himself control. He may be quiescent, however powerful the motive which may present. He may be active in the seeming absence of all external or foreign motive. He acts differently under the same circumstances ; and after the same manner under the different. He is, in a most important sense, an independent being, and this it is which is his glory and his danger. But with this are associated other principles, and these are so related to the will, that this may receive the wisest and best direction, and all its promptings be for individual and general good. Thus it is that in a constitution which is more complicated than any thing else in the universe to which our knowledge extends, the utmost harmony may prevail. A power infinitely varied, or diverse powers, are susceptible, by their very constitution, of a direction which shall result in absolute good. There is, however, no such spontaneous and undeviating movement to good, that it shall always be sought for and loved ; and it is the great purpose of education by all its influences to secure to the mind this direction of all its powers. We look for this in the establishment of principles, which shall become rules of action, and however acquired, naturally incline and lead the individual to

what is most worthy his highest nature. We may waste the time of the young upon books,—we may store their minds with things, their names and their properties,—we may continue our discipline by the prevailing doctrines and character of the time into mature life, and have for our portion, mourning over the feebleness of public virtue, and the rareness of individual greatness. The ancients in this had the advantage of the moderns. They found a deep principle of *emulation* in the human mind, and this they addressed with a success which has not since been even dreamed of. In the ancient gymnasium this principle was never for a moment lost sight of, and its nature as well as agency would almost seem to have been different from what it has been since. The effort and performance of the individual, we speak of bodily exercises, were never for a moment allowed to rest in himself. He was not great because he had done all that his mind and body enabled him to do, but also because he had accomplished more than another and all others. The comparison he instituted was not so much of himself with himself, as with the whole of human power, however and wherever exhibited. The effect of the ancient gymnasium upon the scholar was truly astonishing. It was discovered in the power of concentrating the whole will upon that which his own mind prompted, or which was suggested by another. His body, especially in regard to its muscular powers, and to their utmost extent, was a matter about which he acquired a perfect knowledge. He knew that the organs of motion in his frame were capable of producing a certain effect, and he produced it at once. He did not wait to doubt of the height or the distance. His light and powerful frame was impelled by the will at once, as soon as the purpose of the action was presented to his mind. There was no calculation of the risk to life or limb, and there was no injury sustained. Such was one effect of the development of a single principle of our nature. Had we time we might speak of other products of the Grecian education. We might speak of the language of Greece,—'so simple in its analogy, of such complex art in its composition and inflexion, and of such singular sweetness, variety, harmony, and majesty in its sound,'—of the surpassing eloquence, the divine poetry of the same people. Their arts, too, painting and sculpture too might be enumerated. The arts were carried to a perfection only equalled by their language, and like that have descended to us for admiration, not rivalry. The preservation of the works of art of this people is one of the most welcome and interesting facts

in human history. There is now nothing fabulous in the story of the exquisite beauty, and surpassing majesty which the human mind has created, and always has understood and loved. A permanent visible form was given in these works, to those internal spiritual forms, which the mind has received from its author, and which it was a purpose in the fabric of nature about us to develope in all their powers. The painting or statue is a representation of a moral or ideal state. It was the mind of the artist which was transferred to inanimate substances, and the beholder felt, that by a mere act of vision he was made wholly acquainted with the mysterious operations of another mind. It was with the beauty of the external human form, developed under circumstances of climate, habits of life, and the moral and physical discipline of the gymnasium, that the artist felt an intellectual correspondence; and his statue or his painting was a sublime generalization of the individual perfection he was allowed every where to contemplate. His labours were the delight of all, and if Socrates found a willing and intelligent audience in the workshop of the mechanic, while he discoursed of philosophy, so did Zeuxis and Praxitiles appeal as successfully to the multitude, when Iphigenia, at the altar of sacrifice, glowed from the canvass of the one, and majesty and beauty lived in the marble of the other. We owe much to this reverence, this love of the great in the arts, which a mere populace could feel and act from. We owe to it much of our veneration for antiquity, much of our knowledge of what the mind then accomplished in one direction, for it was among the means of preserving to us some of its greatest achievements.

Such was the education of ancient Greece, and such were some of its effects; at least they existed together. Some attempt has been made in this country to introduce into schools a portion at least of the physical discipline of the gymnasium, and with a view to the growth of the mind, as well as to give tone to the body. As far as our knowledge goes of this subject the attempt has not been a successful one. We have talked with the boys from some schools where most has been attempted in this way. But we have learnt from none of them of any marked success. At first much has been done, but the effort has soon been relaxed, and at length laid aside. We all know the result of an experiment in this city, which was begun with much zeal, and at no little cost, but the time and the money were alike both sacrificed. We have been led into these remarks from a conviction of the importance of the subject.

There is another consideration which though, by the way, seems to us important enough to warrant this allusion to the ancient education. We believe that in a character thus formed the deepest principles will have place, and exert an habitual influence. If we would have a powerful and useful mind we must make for it a fitting dwelling place, a sound body. Of how little worth comparatively is true moral courage, if the body, which it might make subservient to some of its purposes, and of good too, be infirm and decayed. Our scholars, at least in this part of the country, have been almost proverbially short-lived. An early grave covers some of our most gifted men, and this mortality in many, if not all these instances, has been traced to a sacrifice of the body to intellectual labour. And how are we to prevent such evil, or rather how may the whole purposes of the gymnasium, of education itself, be obtained here. We must appeal to the same principle which the Greeks addressed with so much success. The appeal will be an enlightened one, and should be carried no farther than to give the young a deep and lasting interest in the system. Discipline should be as exact in its requirements in one department of the gymnasium as in the other. We have no doubt that a school which combined all the means of physical and intellectual health and progress, would very soon become the most crowded, and at the same time beyond all comparison the most useful.

Had we not already devoted so much of this article to a general view of the purposes of instruction, we should willingly enter into a more detailed investigation of the subject. We should have insisted on the importance of laying deeply in the character by early discipline, the principle of enlightened, rational, *obedience*. If we would teach self control, its first lesson must be found in a wise discipline. The whole experience of life is one vast system of influences. Much of all this is beyond our control at any and every period of life. In youth it is more direct, and if we may so say, more artificial than at any other time. It must have an agency in the formation of the future character. It should be wise, then, such as the mind may usefully yield too, though it may not be able to understand it. And to this it *must* yield. If it be trusted to its own imperfect views, to its own uncontrolled passions, there is ruin in its path, and unutterable misery for all connected with it. Again, we would have asked if the present age be not wanting in that respect for superiors, for parents, and instructers,

which prevailed in the preceding. We do not allude to domestic tyranny, which has been as destructive, or more so than the opposite error of overweaning indulgence. But we would have asked if the sentiment of respect, of deference to those above us, has not been impaired by our system of domestic and school discipline, and that at least one form of benevolence, courtesy, with its kindred in the young, modesty, is less valued and called forth than formerly. Is not the age trifling and superficial; and if so, is not much of this character to be ascribed to the early manhood of our children, and the unwise importance that is given to the least valuable of their earlier attainments? We think these questions are pertinent. A country's history is to be looked for in that of its children. If these are wronged by our systems the evil will be alike upon us and upon them. No system can be perfect which has not within it the means of calling forth and nourishing the affections. Let a child feel that you are the direct agent of good to him, and that your whole discipline of him is for good, and his obedience and gratitude, or love, are almost necessary results. In the progress of his mind, the true nature of this agency will be taught and learnt. The transition from gratitude and submission to a father or friend, to the supreme parent, will be easy and direct, and we may have almost without an effort planted deeply in the mind and heart, the sure means of a present and a future felicity.

It remains to speak of the means of education. We have said that no subject is more interesting than education in the extent in which we have used this term. We can hardly make it too comprehensive. In its means, we have said, are embraced all the direct, and all the indirect influences which communities with all their institutions, and individuals with all that may be personal to them, can exert on the mind. It begins with the first consciousness of the infant of the things and beings around him, and it goes on without a moment's interruption till that consciousness ceases in death. Whatever affects the mind, however remote, or however near, is contributing to that result which we term education. It is now public opinion, when it prescribes its plans for the multitude, and without adverting to such a result, produces a common level in moral and intellectual attainments; and it is now the dogmatism of the individual, which provides for a success of which it may comprehend the amount, but considers a provision for a greater, a matter of very questionable experiment.

Some very interesting views have been recently taken of the subject, and which it cannot be too ardently hoped will at length come universally to prevail. Education has been considered in regard to the state of the mind, the capacities it may give it of remoter and greater acquisitions; and has been less valued for the amount of particular knowledge it may yield, —a store of what, if we so express it, is external to itself, and much or the whole of which, may be lost in new acquisitions, or retained without contributing any absolute strength to the intellect which it burdens.

The modes of communicating knowledge to the young, (and here we include the means), or of meeting in the best manner the increasing vigour of the intellect at this age, are receiving a portion of the regard which the subject demands; and the question is gradually becoming the main one, how shall we meet the demand in such a manner as will most surely secure a continuous and perpetual progress of the mind? This inquiry with different men has ended differently. With some it is believed that a perpetual demand, should be made upon the mind, or that most of the working hours of early life should be spent in a school, or in a preparation for one. Upon some children the experiment is successful; the native elasticity of childhood overcoming the tendency of long continued pressure to depress the powers of both body and mind, and rapid progress is made. With others, and it is believed with many, the effect of this system is different from all this. Listlessness becomes a habit of the individual, much indifference about success or failure; or a disposition to be satisfied with the mere accomplishment of the prescribed task, and for the sake of finishing it, rather than to find in the success an incitement for fresh and more vigorous effort.

With others, the amount learnt is a matter of comparatively slight moment. A few hours only are devoted to school, and the intervals are in no measure occupied by study. The mind at these intervals is entirely relieved from an artificial and prescribed use of its powers. The body is now active, ministering in its ceaseless motion to the happiness of the individual, and securing perfect development, and all desirable vigour. The mind is not inactive in such moments as these. The play of a child is an intellectual occupation. All its powers, or all which have come into activity, are concerned in this bright and joyous occupation. A perpetual succession of what will for its hour satisfy goes on, and we feel assured that in such a system,

where the apparatus of motion, and the spring and principle of its movements are equally active, and equally perfect, that the progress and changes of time will be approximations to the perfection of the compound being we contemplate. It is foreign to our purpose to indicate any precise course of study for the young, but there would seem to be good reason to have some regard to the individual as far as the circumstances of the case will allow. There are intellectual as well as moral propensities, and where any one is sufficiently prominent to be distinguished among all others, some special regard may be very usefully had to this in the course to which the individual may be submitted. If phrenology, the science from which Mr. Combe looks for so much in ascertaining particular biasses, come to be applied and acted upon as he believes it will, much may be discovered to aid in this very difficult task of adapting individual discipline to individual peculiarities. In the mean time, the fact that they exist, and may be discovered, should not be lost sight of, and a wise instructer may do much with the knowledge he may acquire concerning them.

Beside the age and individual propensities, some regard should perhaps be had to the situation of individuals in the direction to be given to their minds and studies. In this country, where distinctions are more nominal, at least than in Europe, it is not strange that it has received so little attention. There is a natural adjustment here of means of instruction to situation in places remote from capitals, and he who wants more than what the average local provision supplies, and has sufficient means, may find it elsewhere. In cities, in many at least, the various classes have a common property in the means of education, for they are defrayed by a public or general assessment, and all equally enjoy them. No practical inconvenience, we believe, has yet resulted from this arrangement, in this country. Remarkable endowment attracts attention to its possessor, and if he want the means of wider intellectual advantage these may not be denied him. The practical disadvantage of our system can only be found in its rendering the labouring classes less able or willing to discharge the relative duties of life, and which duties it is the chief business of education to teach and prepare for. We are not disposed to think that this has been to any important degree its effect. In Europe, at least in England, this topic has excited some discussion. In this connexion the Quarterly Review has the following. 'It will, in all likelihood, become manifest ere long, that the labouring classes,

will not permanently devote a large proportion of their leisure time to the acquisition of knowledge, either by means of reading or any other sort of application. Novelty and variety give a temporary impulse, and the curiosity which is natural to man may prolong the exertion; but in no age or country can a large proportion of those whose lot it is to earn their bread by the sweat of their brows, be prevailed upon regularly to begin intellectual exertion when their daily task is ended. The body then requires repose; and domestic concerns demand attention; and if the few hours which remain are applied to that which with all men ought to be the chief concern, the improvement of the heart, it would probably be found the surest means of advancing the improvement of the head also. If mechanics and labourers could be persuaded to make a study of the Bible, it would be found to convey more useful knowledge, for this world as well as the next, than all the volumes and lectures which are likely to be prepared for their edification.'* These remarks are not made from any hostility in the reviewer to the instruction of any order in society. We have not introduced them for application here, but because they bring so distinctly into view the paramount importance of religious instruction; such let it be observed as the *study of the Bible* may afford. We would not confine the commendation of this study to any one class of men. It belongs equally and alike to all. Its faithful study has a claim upon us as intellectual and moral beings. It reveals the internal, the spiritual nature of man, we had almost said, with the distinctness of vision. It teaches what are its powers, and what are the purposes in its creation. It reveals immortality and the bliss which belongs to it. It addresses itself especially to that sublime principle within us, faith; and shows how appropriate are its objects to the principle itself. It finally, in its instructions, meets the great purposes of all education, and to which we have given a distinct place in our remarks, the establishment of the surest principles for the whole conduct of life.

We have been led into these remarks from an examination of Mr. Combe's work. We have placed it at the head of this article not to analyze, but to recommend it. It treats of the constitution of man in its relation to external things. He first shows what the constitution of things is, and the laws of their being and action. These are shown in a great variety of

* April, 1829. pp. 494--495.

striking particulars. The physicial, the organic ; the moral and intellectual constitution of man are next treated of, and the precise relations of these to each other, and to external things, very carefully traced. This is done by a detailed account of the correspondences among all this variety of being, especially as it regards the laws by which they are severally governed. We have in the next place, very amply discoursed, what the effect must be, and actually is, of an infringement of these laws ; and what a strict obedience to them necessarily produces. In the one case the individual must be miserable, and in an exact proportion to the amount in which the law or laws have been violated. Implicit obedience, as far as the relations treated of are concerned, has its reward in the enjoyment which necessarily attends it. The whole system of things is shown to be one of perfect benevolence, and punishment is no less so both in its necessity and its consequences than is reward. The contrivances in nature for promoting human happiness, and the adaptation of the constitution of man in all its variety for the full operation of all these means of good, are treated with great force and beauty. The author has secured to himself the interest of his reader by the clearness with which he presents his subject, and especially by the variety and felicity of his illustrations. It will teach every one much that it concerns him greatly to know. The instructer of the young, and the advanced scholar must acknowledge their obligations to Mr. Combe for the important knowledge his work contains. We close by recommending it to the whole community.

ART. II.—1. *Letters written in the Interior of Cuba, between the Mountains of Arcana to the East, and of Cusco to the West, in the Months of February, March, April, and May,* 1828. *By the late Rev. Abiel Abbot, D. D. Pastor of the First Church in Beverly, in Massachusetts.* Boston. Bowles & Dearborn. 1829. 8vo. pp. 256.

2. *Sketches of Naval Life, with notices of Men, Manners, and Scenery, on the Shores of the Mediterranean, in a Series of Letters from the Brandywine and Constitution Frigates. By a Civilian.* New Haven. Hezekiah Howe. 1829. 2 Vols. 12mo. pp. 570.

IN pursuance of the design, mentioned in the introduction to the present volume of the Journal, of discussing those things

which form the *subjects* of education, we now enter upon a review of that large class of works which profess to describe foreign countries from actual observation. Books of this description claim and receive considerable attention in early life, and contribute not only to the mass of geographical knowledge which a young person acquires in the process of education; but to the far more important object of liberalizing the mind, by the removal of national and local prejudices and the infusion of that humane and philosophical spirit which travel itself is so eminently fitted to produce.

To say merely that a youth must read travels in order to understand something of the condition of foreign countries—must apply to original sources of information, instead of resting content with his 'Geography,' and 'Manners and Customs,' is not enough. It is turning him into a wilderness of books, good, bad, and indifferent; and referring him to teachers who are influenced by almost every variety of motives, and furnished with every kind of qualification or disqualification for the office. There is no class of books in which judicious selection is more important than in that which embraces travels, voyages, and descriptions of scenery, society, and manners. To aid those who have the care of youth, in the selection of such works of this kind, as may with perfect safety and propriety be recommended, for the purpose of storing the mind and forming the spirit and character, will be a primary object in this part of our undertaking.

The books before us relating to countries widely remote from each other, and written by authors in widely different circumstances, are alike in one most essential point. They are both written by men actuated by christian principles and that spirit of liberal philanthropy, which should always characterize the traveller; and much more the writer of travels.

Doctor Abbot visited Cuba in the winter and spring of 1828, for the sake of its salubrious climate, which is so peculiarly efficient in restoring the health of persons afflicted with pulmonary complaints. His opportunities for observing the features of the country and the state of society were ample, and his admirable talents for observation and description have given us a picture of Cuba as accurate and graphical as it is interesting. Nothing seems to have escaped his quick and scrutinizing eye. He gives us not only the grand features of each scene, but the minuter parts, not only the 'magnificently great,' as Dr. Johnson would say, but the 'elegantly little;' not only the form and costume of these interesting islanders, but their finer traits

and fleeting expression ; the free and easy air of the Montero, and the nameless grace which characterizes the Cuban female, from the belle who moves in the proud circles of Havana to the humblest cottager among the Camarioca hills. The country of which he has presented so lively a picture is deserving of notice among us ; and on account of its proximity and growing commercial importance it is particularly so to the rising generation.

Cuba is undoubtedly the most important and interesting island of the Western Archipelago ; important not less on account of its salubrity and fertility than its size and its numerous white population ; and, from the character of its scenery and inhabitants, not less interesting to the attentive observer of men and things, than to the politician or commercial speculator.

The principal part of the white population of the other West India islands consists of adventurers, who resort to them for a temporary residence to accumulate property which they propose to spend at home. In Cuba the case is widely different. The white inhabitants of the islands, who, by the way, are more numerous than those of all the other islands, are mostly natives of the country. Their ancestors were born there ; the estates of the great proprietors and the titles of the resident nobility,* have long been transmitted through their families, and the mass of the people have, by the lapse of time, acquired a sort of national character of their own, in which the love of country is by no means the least prominent trait.

Among the higher classes there are many of the descendants of the most illustrious men of the parent country ; and the traveller is continually recognizing names here which have graced the brightest epochs of Spanish history. The early adventurers to the western world often fixed themselves in this island, the scene of many of their enterprizes, and here their descendants have remained to the present day. Those who in subsequent periods have come to the island from Spain for the purpose of acquiring property by agriculture or commerce have almost always remained ; prevented from returning, no doubt, by the consideration that the same wealth which would give them importance and respectability here, would by no means entitle them to rank with the ancient gentry, the high spirited *hidalgos* of the mother country.

A similar motive has influenced many foreigners to fix them-

* There are twenty nine resident nobility in Cuba, many of whom have never seen Spain.

selves permanently in the country. When to these circumstances we add that a great number of the white inhabitants of the neighbouring island of Hispaniola, took refuge here after the insurrection which drove them from their home, we shall be at no loss to determine why so large a proportion of the population is white.

We should remark, in passing, however, that it is by no means an easy matter for us to come at the precise relative proportion of blacks and whites in the island; or, what may seem strange to us, for the government of Cuba itself to form any correct estimate of the number of inhabitants, the amount of produce, or any other general statistical fact relating to the island. This arises from an unwillingness on the part of the inhabitants to make full returns; as they are very well aware that such returns are never sought but for the purpose of raising a revenue by direct taxation; and moreover that they themselves are to have no voice in determining the objects or amount of this taxation. A planter, therefore, instead of returning the true number of his slaves, returns half, a third, or even a tenth; and follows a similar rule in reporting to the government of the *siempre fiel isla*, the amount of sugar, coffee, or tobacco, produced on his estate.

This uncertainty extends even to the amount of imports and exports; for it is a literal fact that on inquiry being made, by certain commissioners of the government, concerning the amount of flour, sent from Matanzas to Havana, in a year, it was found to be greater than the total amount entered from abroad at the custom-house of Matanzas; so that, since none is produced in Cuba, an amount greater than all which was consumed during the year in the large city of Matanzas and the surrounding estates and villages must have been smuggled into that port. Again, when a board of commissioners, appointed by the government, attempted to learn the whole amount of products of the island and had brought in their returns, it was found on comparing them with the custom-house books at Havana, that the conscientious planters had returned a smaller amount of sugar for the whole island than is annually exported from the single port of Havana.

For the present, therefore, the statistics of Cuba must be left to conjecture. But the statistics of a country are certainly not its most interesting features. Its moral and intellectual aspect, the adaptation of its scenery and society to affect the mind and heart—these claim our first and highest regard. In point of

actual personal intercourse, it is probable that Cuba has much more to do with this country than Scotland. But which is most intimately known to us? Who will think of comparing the influence exerted over us by the Cubanos to that which we daily feel to be exerted by the Scotch? The former influence is weak because it is commercial only—*material*,—the latter is powerful, because it is moral and intellectual, the intercourse of mind with mind and heart with heart.

It is one of the best characteristics of Doctor Abbot's work, that it makes us acquainted with the moral and intellectual condition of the country he describes. He pourtrays its scenery, it is true, with all the enthusiasm of an artist, but he does not forget to delineate those higher traits on which its future destiny depends.

The first extract which we shall present, will illustrate this observation.

'The cursory view of the free population of the island, taken in my former letters, would be imperfect, should I not attempt some account of its moral character. They have their virtues; and they have their vices. Of the first I shall speak with unfeigned satisfaction; of the last with regret, and, I hope, with candor, certainly without intentional exaggeration. For though my residence in this island has been short, I have been so absorbed in the subject of my investigation, and my feelings have risen so far towards enthusiasm, that I may almost lay claim to the local passion of patriotism. At least I must be allowed to say that few things could give me a satisfaction so solid or so great as to see their virtues increased a hundred fold, and their vices, deep rooted as they are, entirely eradicated.

'It has been with great pleasure, that I have heard, in all parts of the island, which I have visited, of the *parental authority* and *filial piety* of the Spaniards. In a former letter I mentioned, on the authority of a respectable and intelligent Spaniard of Old Spain who had passed six weeks among them, the patriarchal state in which Monteros live, in a district about fifty leagues to the windward of Matanzas. The case is very similar fifty or sixty leagues to the leeward from the same city. A few anecdotes will best illustrate the point which I give on unquestionable authority, and only at second hand from the Montero himself, whom I have seen again and again.

'Having long been employed by the lady, to whom I refer, as a carter of produce to the market, he sometimes took the liberty of conversing with her on his own affairs; and once mentioned the grief, that had come upon himself and his wife by the gross misconduct of his son, then eighteen years old. "Why, mad-

am," said he, "the rash boy took the liberty the other day of going to the next village, without ever consulting his parents, and purchased a machetta, and brought it home. I can never forgive the shopkeeper for consenting to him. But, I assure you, he was not long in possession of his long blade and silver handle, and Russia leather belt. He got his mother to make *impegnio* for him, that he might not have the shame to carry it back, at least before he had kept it a day or two. But I was deaf, and sent him off at once; and I think he will not be likely to take an important step again, without the advice of his parents."

'The age of majority, according to Spanish laws, I understand is fixed at twentyfive. A youth, married or unmarried, but at any rate in his twentyfifth year, was so undutiful, in some matter of conversation, as to contradict his mother. But she instantly corrected the rudeness by a slap on his cheek, and he retired in confusion to vent his feelings in tears of contrition. The proverbial expression in Spanish denoting a spoiled child, "consentida," *a child consented to*,—a child having its will,—is wittily happy, and implies a general sense of the necessity of authority and submission between the parties.

'A youthful Montero, well known in this family, once thought the parental yoke too heavy, and left his father. After one day's absence, he regretted the undutiful step; but dared not return without a mediator. He therefore applied to a person who had great influence with his father, to make impegnio for him.

'He readily attempted to bring about a reconciliation. The father complied with his friend's request to receive back his son; but as soon as he was gone, he said to his full grown boy,—"Where did you think you could hide yourself, that I should not find you?" And gave him a correction, which he will never forget.

'Thus strict is the family discipline among the rude Monteros. It wears a gentler aspect in the higher classes of Spanish society. Here, submission and dependence are courteously demanded, and cheerfully rendered. The young members of the family, with affectionate humility, before retiring for the night, kiss the hands of their parents, and ask their benediction. They bestow it in words like these:—"May God make you a saint."—"May God make you good and happy." It cannot be denied that the most important relations and duties are recognized in this ceremony of every evening; and that its tendency is to enliven the sentiment of respect and affection between the parties, and to improve the sense of their dependence on the great common Father of parents and of children.

'In this connexion, because probably growing out of this family custom among the Spanish, I mention a kindred custom among

the negroes of their houses and estates—the custom of asking their master's blessing, and of ejaculating a petition for his welfare. You cannot pass a half dozen little Creoles, without hearing their cheerful voices commending you to God; and the same thing happens in passing the men and women in the field. Whether from my costume they judge me to be a clergyman, and on this account do it, I know not; but as often as I dismount, *a stranger* before the house of a Spaniard, a servant as he takes the bridle, drops on one knee, and asks my blessing.

'These customs on the part of slaves, which wear an affectionate and religious aspect towards their superiors, it is the soundest policy in masters to encourage, while at the same time it somewhat lightens the yoke of bondage on their necks. They have the pleasure to see, that they are recognized as the humble children of their master; and though there is a measured and awful distance between them and others, they feel a sentiment of dutiful attachment to the family, and a common interest in its safety and welfare.

'But to return from this digression. To preserve to a late period in life the sentiments of authority and duty, is the tendency of the custom among opulent Spaniards, of settling their married children near them; and where they can, in the same house. This is one object in those large mansions in Havana, extensive and splendid enough to be denominated palaces. Three or four distinct establishments, or suites of apartments, are found under one roof, occupied by different members of the patriarchal household. Still in some respects they form one family. There are halls for common meetings,—at least for devotion, which is conducted by a chaplain. Something similar occurs among the Monteros, where a father on a few caballerias of land, establishes his married children and grandchildren all around him.

'On this interesting subject I have enlarged, because it presents a very distinctive trait in the Spanish character—a trait for which, in substance, I have a profound respect. As to the means of its being maintained, and the manner of its being expressed, different nations and different individuals of the same nation, may agree to differ. But as to the thing itself, as to the immense importance of family subordination, there can be but one opinion among pious, moral, or reflecting persons. Dutifulness to parents, tends to piety, to God; submission to domestic authority prepares the members of the family, those thrifty elements of the larger community, to become bright examples of submission to the magistrates, and the laws. And I add, if submission and duty to superiors is not taught and secured in the family, it is probable it may hereafter be necessary for the magistrate to teach it, with a whip of scorpions.

'The war of the revolution served in some degree to lower the

high standard of family discipline in our country; the French revolution gave to it a still heavier shock. The cant and rant of that day was "Liberty and Equality;" and the thing at once penetrated the sanctuary of private life. Parents relaxed their authority, and children, of almost all ages, felt about as old as their parents, were quite as wise, and a little more independent, and a great deal more rude. It was some time before these capital errors were discovered; and it will be much longer before they are fully corrected.

* * *

'A traveller on this interesting island, who passes through considerable districts of the country, or resides in any of the cities, and is a man of observation, cannot fail to be struck with the superior *temperance* of the Spaniards. I refer to temperance in drinking, not particularly to abstemiousness in eating. Their dishes (I speak of the opulent) are almost without number, and prepared with luxurious condiments; and seldom does a dish pass without a judgment upon its merits by the guests, on the evidence arising from *examining the premises*. The simple and nutritious fare of the Monteros is pork and plantain.

'England and America may find a noble example in Cuba of greater caution than they see at home in regard to ardent spirits, cordials, and inflaming wines. It is very rare to witness an example of intemperance in town or country, in Spaniard or white Creole, gentleman or peasant. Healths are drunk sparingly; and toasts very seldom; and the guest is civilly asked, but, I think, never pressed to drink, except by foreigners; and even by them, by the force of good example, they are seldom urged. Fruits and sweet meats in endless variety fill up more harmlessly those moments after dinner, which, in our own country, are often devoted to the history of a dozen of wine, its surprising longevity, its precise merits, and the drinking of it. One of the immediate consequences of this Spanish discretion is, a cheerful party without clamor, sprightly conversation without heat or dissension, and the pleasure of ladies' company to the close of the entertainment—and fine health.

'The Montero is abroad with his wagon or string of mules, in the dews of the night, under tropical and meridian suns, enveloped in clouds of dust, and exhausted with fatigue and sweat; but with thanks often declines a glass of spirit to mix with his water, when hospitably offered by his employer, giving the slight apology that "it is heating." A hardier, healthier, more muscular race of men cannot be found on the mountains of New Hampshire or Vermont.

'How different is the philosophy of many of the yeomanry of New England, so often appealed to as the virtuous progeny of the virtuous pilgrims. God forbid I should affix any stigma to

them as a body. But how great is the number who pour down "the liquid fire of the West Indies," because they are hot, or because they are cold—because they are about to encounter fatigue, or compose themselves to rest—because they are in company, and are ashamed not to be social, or are alone, and must cheer their solitude—or for any other reason, and for no reason at all, till their farms and health are gone, and their families are in shame and beggary, or the care of the town.

'The subtle vice of drinking freely of ardent spirit crept over the community, as it does over an individual, in so insinuating and gradual a manner, that the danger was almost unsuspected till it was instant; and the chains of the habit were not felt before they were riveted. The community is at length awake to the danger; and aware of the difficulty of returning to the better customs of fortyfive years ago. Something has been done; and much remains to be done. It may at least be said that the community is no longer thoughtless on the subject; the temperate are anxious to remain so; and are on their guard against those initiatory customs, which are the footpaths leading to the highway of drunkenness. The pulpit sends forth its awful warnings; the press contributes its aid in tracts and paragraphs; the laws, and magistrates, and municipal officers, do what they can; and, by the blessing of Heaven, it will be strange if in fortyfive years to come we shall not retrace our steps, and be not ashamed to stand compared even with the temperate inhabitants of Cuba.'—pp. 162--168.

The following extract gives us the Doctor's passage up the Canimar river, and his first impressions of the scenery in the interior.

'The tide in the river is but two feet, and in the bay, little more. Our course was instantly walled in by a lofty bank of nature's masonry, sometimes almost perpendicular, and sometimes with a precipitous slope, I conjecture, fifty, seventyfive, and a hundred feet high. But imagine not that these beetling cliffs appeared in dreary, naked majesty, blackening in a tropical sun. From a few feet in the water, to the top of the height, is a matted growth of cane, and brush, and trees, glossy and brilliant with foliage and flowers, not a plant of which but was a stranger to my eyes. Many of the trees were exceedingly beautiful. The red mango tree runs high with a branchy top, and is as gay and thick with flowers, as an apple-tree in a New England spring. The mahawa has something of a catalpa top, trunk and limb, with a gay red flower, on some of the trees, and a yellow flower on others; and what struck me as a curious anomaly, on some trees were seen flowers, some perfectly red, and some perfect-

ly yellow, so growing naturally, and not by inoculation. In crevices of the rocks, you occasionally discover natural beehives, which are found filled with honey, in situations difficult for the human robber to disturb their busy and well ordered commonwealth. The turns in this river are frequent, presenting the most diversified prospects; the bank, now curving into an amphitheatre, and now fluted in the most beautiful swells and hollows, as if the hand of art had been employed. Now you see a little hut of wattled walls and thatched roof, and a narrow bank of a rod or two, flourishing with great beds of sallads and cabbages, luxuriant in spite of shade. Here runs into the water a little close fence to wall the pigs from the river, while they enjoy the water, and there a still closer fence, to inclose the fishes, probably at the recess of the scanty tide. A duck came swimming along our passage so fearlessly, that the bargeman might almost have saluted him with his oar, and when so near, dipping only, not flying. His form was different from all the ducks I have seen. Various birds appeared on wing, and perch, and on the water, whose forms, and feathers, and names, were all new to me. But, I must not be minute. We at length, after a delightful passage, in the gray of the morning and early sunrise arrived at the head of our boatable navigation. Here we found a number of stores, and boats for the accommodation of the produce of neighboring plantations. Large quantities of sugar, coffee, and molasses are here deposited and thence floated to Matanzas. In the principal store we reposed a little while, waiting for our equipage, which had not yet arrived. I was struck with the appearance of the different negroes at work, letting bags of coffee down an inclined plane of twelve or fifteen feet to fill a boat. They were generally furnished with trowsers, but their whole contour above the hip, was in an exact state for the study of the painter. I have thought that the negroes in Cuba, if I can so soon judge, are not generally so stout and muscular, as in South Carolina. Some are quite small and short, and some are marked as Africans by their tattooed faces and breasts. In this place, while we were waiting, there arrived three Americans, one of whom recognized me. He was from M——d, a parishioner of our friend the Rev. J. B. and a particular friend, as all his parishioners are. I doubt not he is a fine fellow; he has great fluency of speech, and a great deal of sailorlike frankness and good feeling. He was on his way to see his old townsman Mr K. of whom mention is made in one of your letters. At length we started in our volante, which I will take a future opportunity of describing when I have more time, as it is one of the most singular contrivances for transporting the human frame. On we pushed, with our heavy, easy carriage, with two horses, a blackey astride one of them, and a broadcloth screen

extended from the place where our dasher is, to the top of the vehicle, to protect the passengers from an intense blazing sun. We soon came to plantations, now of coffee, now of sugar. The charms of the prospect at every rood, and the variety, it is out of my power to describe, in what of time and paper is left to me. Carolina in its general appearance is lifeless and dull, compared with almost any spot, since the plantations commenced. You often see a beautiful white stone wall, and sometimes faced, inclosing the plantation from the highway; sometimes a picket fence, withed to a single slab, by a cord cut from the forest, as big as your finger, and drawn as neatly as a cord of hemp; sometimes a living hedge of stakes driven like our willows in a wet place; sometimes a beautiful lime hedge is the fence, and rarely the awkward zigzag Virginia fence, as it is called in the United States, employed as a lively figure to indicate the course of one who sees double. The road is often adorned by a row of those charming and invaluable trees, the palm. These grow to a great height, with a trunk as smooth and polished as if it came from the turner's lathe, from the root to the top, where a few feet of the stem are of a rich, green color, surmounted by a tuft of leaves, which remind you of the plumes adorning the bonnet of a knight of high degree. These often line the broad avenue which leads from the highway to the planter's mansion. They take infinitely more pains to adorn these avenues, than in South Carolina, a few at Goose-Creek excepted. I observed one avenue of lofty bamboos, thickly set, in such a manner as to form a beautiful Gothic arch. For beauty nothing could exceed it, except the live oak. After travelling three or four miles, my friend turned in at his friend's, Mr M.'s, a hospitable German. It seems as if the garden of Eden could not be more beautiful than his grounds. His buildings are handsome, and his house, with piazzas on every side, spacious and airy. Everything around looks like a garden, and borders of wild ipecacuanha, in red blossoms, skirt his walks, and orange trees full of ready fruit, alternating with trees still more ornamental, form his avenues. He was not at home. Mr B. with a liberality freely given, and freely taken, ordered his horses out, and a breakfast, as quick as possible. We had in a few minutes, broiled and fricaseed chickens, and everything else which the heart could wish. Mr B. next ordered two mules to replace his horses, and at this crisis the host arrived to approve with a cordial greeting all that had been done, and all that was to be done. We started on our last stage, and passed many beautiful plantations, which succeed each other, with little or no intermission. The roads for much of the way, are excellent; sometimes the limestone renders it rough; but a lusty rock is encountered often without fear by the sturdy wheel, and without serious inconvenience to the rider, so singularly constructed is the carriage.

'Mr. B.'s place is very delightful. A fine walk, with a row of palm trees fronts his place; an avenue of the same leads to his new and handsome buildings. These I shall describe hereafter, as also the grounds. A semicircle of beautiful hills at a few miles distance seems to enclose his prospect. This plantation is yet young, and every year is filling up a picture, which any description of mine will fail to present in all its beauties. My welcome so cordial from the host, has been as much so from his lady. Three sweet children are sporting about the floor, and young Mr I. a great invalid, is receiving the same generous hospitality with myself. With a neighboring planter we sat down to a various and excellent dinner, which closed with a dessert of pines and oranges, figs and raisins, plantains and olives, and delicious guava jelly. Such is the rapid sketch of my present situation. I bless God for his mercy by sea and by land; I rejoice in my removal to a still more auspicious climate, and to a world inexhaustible in novelties. I see nothing old; all is new. It is, as if I were transferred to a new world—to Jupiter or Saturn, to Venus for beauty, to Mars or Mercury for fervor and glow. It seems like gentle summer, fanned with refreshing gales. My spirits are cheerful and equable, and I know not at present anything that I wish altered, except that my heart may be more grateful to God and man.'—pp. 6–9.

There are some errors in the minute descriptions which Doctor Abbot has given. Indeed it could not be otherwise, for he was frequently obliged to depend on the statements of those who were not so accurate observers as himself, and yet were anxious to appear intelligent.

In the third letter he mentions the *bajuca* affording to the thirsty traveller a sweet milky juice. It would not be wholesome for the thirsty traveller to taste this sweet milky juice. Of the many varieties of *bajuca* or wild vine, there is one which produces a milky looking sap, which, the natives say, is deleterious, if not poisonous. There is another variety, which may be cut as easily as a sugar cane, and the natives are in the habit of cutting off portions of it with their swords, when travelling in the woods; reversing the piece detached, turning the end, which grows uppermost, down, and drinking the stream of clear, limpid, (*not milky*) sap which runs out. This sap is not sweet, but perfectly insipid and in every respect like water. The writer of this article has tasted it more than once, not without admiration of the excellent contrivance for supplying wholesome drink in forests where a stream is seldom found and a spring would be esteemed a wonderful discovery.

The statement on page 54, in reference to Mr M.'s treatment of his slaves, would lead a common reader into the very erroneous supposition that Mr M. is not a kind master. Now as we know from personal acquaintance, the direct reverse, we are inclined to think that he must have been quizzing the worthy Doctor with his account of the 'two hundred lashes,' the 'wounded back,' &c. There is not a more indulgent master or a kinder hearted man in America than Mr M., nor one who can pass off a capital joke with a graver face.

On page 34 the author, confiding in the statements of some ignorant person, has said, 'Beyond this limit' (that is, the mountain where he stood, and which he calls Hacana in the body of the work and Arcana in the title, the real name being Jacan) 'to the east, the island is a level country about 300 miles, from sea to sea.' The truth is that the mountainous country commences at Villa Clara, which is situated less than one hundred miles to the eastward of the Jacan mountain.

A few trifling errors of this description occur in the work and might easily be corrected, if previous to the publication of the second edition, it were submitted to the intelligent tourist in whose society Dr Abbot lived and travelled a considerable part of the time he was in Cuba.

The 'Sketches of Naval Life' though relating to countries more remote from us than Cuba, advances a much stronger claim to our interest than the 'Letters.' The countries visited by the writer comprise a considerable portion of what was once called 'the World.' Countries which will ever be regarded by the classical scholar and the Christian as the *home* of his mind.—Scenes where his youthful fancy was taught to revel, where those struggles of freedom and triumphs of faith were seen and recorded by which the noblest sympathies of his nature were first enkindled.

The author seems to have viewed this classic ground with the enthusiasm of a scholar tempered by the philosophy of a Christian. We have room but for a single extract which includes the author's visit to the tomb of Agamemnon.

'Argos, until the present war, contained eight thousand inhabitants. It was beautifully situated, and, with its venerable castle above, was a fine object from every part of its extensive plain: but the whirlwind of Turkish war swept over it, and left it a mass of ruins. It is now rising again, and though but a few

streets have been built up, is thronged with an active population. A striking object among them, was an old blind man, led about by a boy with a guitar. He was singing to the crowds, and received a few paras in return: I stopped among them; they led him to my horse; and as he sung in soft Greek, about Greece and the Greeks, with such men about him as I have described, I thought of Homer, and almost felt myself realizing the visions I have had over the pages of the Illiad. I was in Argos too, Agamemnon's city; and was going to Mycenæ to see his tomb; and had only the day before been at Tirynthus.

'Leaving the blackened ruins of Argos, and taking the road to Corinth, I entered on the large plain that stretches to the North, North West, and East of the city; and three miles from it, crossed by a stone bridge the channel of the Inachus; this is now dry, but is occupied by a swollen and turbulent stream in winter. At the same distance beyond it, I left the main road, and striking into a path on my right, ascended some low hills lying against a ridge, like themselves of no great elevation or extent. It starts from a break in the mountains, runs Westward a few hundred yards, and then stretches to the South West. On it stood Mycenæ, where ruled, you recollect, Perseus, Sthenelus, Atreus, Agamemnon, Orestes, and many other celebrated names. Apart from all these associations, it is a place of vast interest to the traveller. It was destroyed by the jealous Argives, five hundred and sixty eight years before the Christian era. Pausanias speaks of its ruins, and describes them, many of them as they exist to this day: the knowledge of its position was soon after lost; and in Strabo's time, no trace of it could be discovered. Modern research has brought it to light again, and the remains of Mycenæ are to Greece, what Herculaneum is to Italy.

'I ascended the ridge, and immediately after reaching its summit, observed on my right the monument that has so greatly puzzled antiquarians, and has received from them titles sufficient to satisfy a dozen modest antiquities. The names of Agamemnon's tomb, the Heroum of Perseus, and the brazen treasury of Atreus, have been most usually applied; but all modern theories on the subject are overthrown by the recent discovery of another one, apparently similar to it, in all respects. The one I first noticed, is on the Eastern side of the ridge, in which it is partly imbedded. The entrance is on the East. A descent of thirty paces, along a wide alley, lined on each side with large stones, brings the visitor to the door way, where he stops in astonishment, at the immense size of the materials of which it is composed. It is fourteen feet high, and formed of solid blocks, of that length, with proportionate breadth and thickness: above is one nineteen feet in length; and, just within this, is another

whose dimensions fill us with admiration at the bold and laborious enterprize of those times. It was originally twenty seven feet long, seventeen wide, and four and a half in thickness, but is now broken in the middle. Its vast size is seen only in the interior. The sides of the door way, which is eight feet wide, and twenty two in thickness, is composed of corresponding stones, some of them thirteen feet in length; all are regularly shaped. The edifice itself has been properly compared, in shape, to a bee-hive: it is forty five feet in diameter, about the same in height, and is lined with rectangular stones, all of large dimensions: the apex is formed by a circular stone, slightly ornamented. On the right, one fourth of the way round, is an entrance to a small cubical chamber, rude and cut simply from the natural rock, a very handsome breccia. In the stones coating the inside of the large chamber, are numerous brass nails, but their object is unknown, and indeed the whole is a mystery. Should the other monument be laid open, its character would probably be ascertained; and this we may expect to see done before many years. This one is about three hundred yards further north, near the summit of the ridge, and one hundred paces from the entrance of the citadel. The upper part has been excavated, and seven tiers of stone are laid bare, sufficient to shew that it is of the same character as the other, both in shape and dimensions: it was done, the natives informed me, by order of Veli Pacha, at the request of an English traveller.

'Turning from this, towards the East, we have the citadel before us, and stand again amazed at the huge size of the materials, and the skill with which they are fitted together. "There were giants in the earth in those days," is the involuntary exclamation: so thought the ancients, and these structures are attributed by early and grave writers to the Cyclops; whence the order takes its name of Cyclopean. The ridge at this part is precipitous on each side, and the walls of the citadel run along its edge: they are of vast rocks, without cement, but with their inequalities corresponding so exactly as to give the structure an impregnable character. The entrance is on the West: it is along an alley, commanded by the heights of the citadel, and then through a gate-way, over which are the two lions, in bas-relief, mentioned by Pausanias; Nemean lions, if it so please you, though they bear a much stronger resemblance to leopards or tigers. The gate-way is nearly filled with rubbish; but in the lower part of the huge lintel are the holes, in which the pivots of the gate worked, as fresh as if made but yesterday: they are six inches in diameter. The gate was folding, and must have been of immense thickness, as the sockets for the bar, which are also uninjured, are three and an half feet back of those for the pivots of the gate. We are now in the citadel,

and find, that not content with the high massive wall, that guards its exterior, they here faced each rise of ground with a similar defence; and the assailant is met with new difficulties at every step. There are numerous reservoirs scattered through the interior, with their stucco firm and uninjured: they are sufficient evidence that the Cyclopedian order was not the result of necessity, arising from their ignorance of mortar, as I have seen it somewhere asserted: near the Eastern end is a postern, similar to the great entrance, except in size.

'The most interesting object I have yet to mention. I had noticed remains of an aqueduct passing over the ridge: it could be easily traced to the citadel, and along a narrow passage between its Northern wall and the edge of the precipice: from this, I followed it into the break of the mountain, on the East, and at the distance of four hundred yards, came to a breach, from which the water gushed out, and flowed into a glen on the South. It created singular feelings, when I found myself standing among such scenes; ruins of a city, that had risen, and gained a mighty name, and was destroyed, when Rome was yet little more than a village; and when I saw the water flowing in the channel formed for it, by the men of Agamemnon's time. The aqueduct is of the simplest character: it is of curved tiles, of no great depth, imbedded firmly in the earth, and covered with stones, over which earth was thrown. I think I am safe in giving it that age: it is of great antiquity, for the rocks, which formed its channel, at the citadel, are deeply worn, as are the sides of the precipice where the water overflowed: we have no notice of any ancient town here after the destruction of the original city. It is carried along the ridge, and thence to a reservoir in the plain. There is a wall, also, proceeding from the citadel, and enclosing the ridge, not heretofore noticed by any traveller. The whole place deserves more attention than has hitherto been given it: no other remains of this age, are in such excellent preservation: if examined, it would probably throw light on a period of Grecian history, still involved in obscurity and doubt.

'The citadel of Tirynthus, is of the same age and character, as that of Mycenæ. It is on a small eminence in the great plain, about three miles N. W. from Napoli: of the city itself, not a vestige remains, except some masses of brick work, from which nothing can be determined.

'You have now the plain of Argos: in the days of its glory, it must have been a splendid place. The plain itself, with majestic mountains on one side, and a bright sea on the other, is a beautiful one; and when it had around it Argos, Mycenæ, Tirynthus, and Nauplia, with villages and groves and green fields between, while in all directions, the sun's rays gleamed from

marble temple and portico and tower, or from the tombs of the mighty dead, it presented a scene that would yield only to Athens in interest, and scarcely to Athens. But how are the mighty fallen!'—pp. 4–9.

The works which we have thus cursorily noticed are well deserving of the attention of parents and teachers. The Sketches, in particular, should be frequently referred to in connexion not only with the study of geography, but that of the classics. Nothing excites a stronger interest in the deeds and writings of the ancients than a reference to the present state of the countries where they lived. Such a practice gives a reality and presence to what the pupil is reading, which excites his curiosity at the same time that it relieves the labour of translation and criticism.

School libraries should always be furnished with well selected Travels; and we know of none which better deserve a place in them than the works before us. The young tyro will find nothing in them which can corrupt his heart or mislead his judgment of foreign countries, and he cannot fail of learning much which is suited to liberalize his mind and raise him above the influence of national and local prejudice.

ART. III.—*Elements of Technology, taken chiefly from a Course of Lectures delivered at Cambridge, on the Application of the Sciences to the Useful Arts. Now published for the use of Seminaries and Students. By Jacob Bigelow, M. D. Professor of Materia Medica, and late Rumford Professor in Harvard University; Corresponding Secretary of the American Academy of Arts and Sciences; Member of the American Philosophical Society; of the Linnæan Societies of London and Paris, &c.* Boston. Hilliard, Gray, Little, and Wilkins. 1829. 8vo. pp. 507.

THIS work answers faithfully to its title. This is no slight praise. It every where shows in what the application of the sciences to the arts consists, and what the effect has been of this natural association. Every page of it contains useful knowledge. Much of it is within the comprehension of every

one, and of the whole, the knowledge will be easy for the many to whom the elements of the matters treated are tolerably familiar, or who will give them the service of some reflection. This work may be read for the entertainment it will afford. This character is somewhat peculiar to it; for it is not a common thing to meet with a strictly elementary work which possesses it in so striking a degree as to interest the mass of readers. We feel satisfied that this does; and where so much useful knowledge is in close company with so much that is really entertaining, the author has laid for himself a strong claim on the obligations of the community.

The purpose of the author in his present publication is contained in his advertisement to the volume.

'A course of Lectures on most of the subjects which occupy this volume, has been delivered at Cambridge, during ten years past, in pursuance of the will of the late Count Rumford, by whose bequest a professorship is founded in Harvard University, on the Application of the Sciences to the Useful Arts. Parts of the same course have been repeated in Boston, to large audiences.

'The degree of interest which has been taken in these Lectures, has led me to believe that the subject is, in itself, peculiarly capable of exciting the attention and curiosity of students. There can be no doubt that the knowledge, which this study is intended to furnish, is of great use in the common affairs of life; and probably its advancement has contributed more than that of any other science, to the improved condition of the present age.

'A certain degree of acquaintance with the theory and scientific principles of the common arts, is found so generally important, that most educated men, in the course of an ordinary practical life, are obliged to obtain it from some source, or to suffer inconvenience for the want of it. He who builds a house, or buys an estate, if he would avoid disappointment and loss, must know something of the arts, which render them appropriate, and tenantable. He who travels abroad to instruct himself, or enlighten his countrymen, finds in the works of art, the most commanding objects of his attention and interest. He who remains at home, and limits his ambition to the more humble object of keeping his apartment warm, and himself comfortable, can only succeed through the instrumentality of the arts.

'There has probably never been an age in which the practical applications of science have employed so large a portion of the talent and enterprise of the community, as in the present; nor one in which their cultivation has yielded such abundant re-

wards. And it is not the least of the distinctions of our own country, to have contributed to the advancement of this branch of improvement, by many splendid instances of inventive genius, and successful perseverance.

'The importance of the subject, and the prevailing interest, which exists in regard to the arts and their practical influences, appear to me to have created a want, not yet provided for, in our courses of elementary education. Information on these subjects is scattered through the larger works on mechanics, on chemistry, mineralogy, engineering, architecture, domestic economy, the fine arts, &c., so that it rarely happens, that a student in any of our colleges, gathers information enough to understand the common technical terms which he meets with in a modern book of travels, or periodical work. It is only by making the elements of the arts themselves, subjects of direct attention, that this deficiency is likely to be supplied.

'To embody, as far as possible, the various topics which belong to such an undertaking, I have adopted the general name of Technology, a word sufficiently expressive, which is found in some of the older dictionaries, and is beginning to be revived in the literature of practical men at the present day. Under this title it is attempted to include such an account as the limits of the volume permit, of the principles, processes, and nomenclatures of the more conspicuous arts, particularly those which involve applications of science, and which may be considered useful, by promoting the benefit of society together with the emolument of those who pursue them.

'In preparing for the press the lectures on which this work is founded, some variations from the original form have been made, together with such additions as my leisure from professional engagements has permitted. In doing this, occasional use has been made of the works of Robison, Young, Tredgold, and several of the late chemical writers. But as the present elementary volume is composed for the instruction of the uninitiated, rather than for the perfection of adepts, it has been found necessary to condense and to endeavour to render intelligible the subjects of consideration, rather than to dilate them by minute expositions and details. For the use of those students, who may wish to extend their inquiries in reference to any of the particular subjects, a list of some of the more prominent authors, and works of value, that treat upon the several subjects, is subjoined at the end of each chapter. Among some of these works, the authorities for the facts stated in the preceding chapters, will in most instances be found.

'For the convenience of seminaries which may make use of this work, the wood cuts and diagrams which are interspersed with the text, are reprinted at the end of the volume.'

In the introduction Dr Bigelow has briefly sketched the progress of the arts, and the circumstances which have determined their precise state in the different periods of their history. Arts are for the supply of wants, whether of necessity, convenience, or luxury. The amount of want then is the measure of their perfectness. They were quite sufficient for the demand, probably, in all periods of human history, and it was with the progress of the whole mind, the whole social state, that they made progress. Science was alike the fruit of the growth of the mind, and had its origin directly in a severe observation of every thing in nature and art which was favorable for its attainment. It is the doctrine of principles, slowly developed, indeed, but of unfailing truth, and sure persistency, when once established. Much of science has probably depended on mere accident. Without being aware of it the principle has been successfully applied, and it may have been for a long time, without having been understood, or adverted to; and at times the most frequently observed phenomena have, without the least effort of thought, brought principles to light and to use, which the philosopher has devoted his whole mind to develope, and of which the humblest artizan has afterward habitually and successfully availed himself. From this fact in the history of discovery, it is safe to infer that we are at all times and every where surrounded by, and in near neighbourhood with, opportunities for discoveries which would be a lasting honour to ourselves, and a permanent benefit to others. These are daily more and more brought to light. All that is known is lessening the difficulty which lies in the path of valuable novelty; and science, in lending its salutary aid, is giving a wider application, and still greater extent to the well known.

While so much may be granted to what is termed accident in the progress of discovery, most useful truths, and very curious knowledge have been derived directly from the existing science. To this may be referred the doctrine of the combustibility of the diamond, which Newton taught years long removed from the establishment of the fact itself by the aids of modern chemistry. So was the preservation of copper on the bottoms of vessels by the contact of a more oxidizable metal, as taught by the late Sir Humphrey Davy, a discovery which belongs wholly to a severe course of induction from previously established scientific principles. It is in this way that science is to bring to light the unknown,—to go before in the toil of discovery, and while it lessens the labour, make the harvest

more sure. There seems no end in such a progress, and it is the honour of our age that so much is now doing to promote it. It has a single recommendation which must secure to it the strong interest of those who are devoted to scientific labour. What it discovers is sure, and has a determinate place in the system to which it belongs. It is less likely than perhaps all other kindred knowledge, to be unsettled by future discovery. It is the fruit of principles already established, and derives from them its individuality, and its permanence. There is much in these considerations to recommend the method to which we allude. But it should not be concealed that there are, and must be periods in the history of every science, in which principles are insecure, or not wholly developed, and the system which rests on them may require to be more or less changed or modified in the progress of discovery. Some of this uncertainty has always attached to chemistry, a science which rests so much on facts as the strong pillars of its support. There never was a more beautiful system than that of Lavoisier. It was perfect in the light which his discoveries shed around it. His arrangement, and nomenclature, every where discover the beautiful symmetry, the exquisite harmony of that which they illustrate. We need not even advert to the change to which this system has been necessarily subjected in the progress of discovery; and we need not inquire how far these have had their necessity in the manner in which much of chemical discovery was originally brought about.

Dr Bigelow's work is on the application of the sciences to the arts. This is to us the source of the strong interest which we are quite willing to acknowledge we feel concerning it. We would recommend it to the man of leisure as furnishing a vast variety of topics for reflection, and as a treasury of interesting fact. There is too much concern in the whole community in the matters about which it treats for the man of leisure even to escape all its influences. Knowledge is coming to be the property of the multitude, and he whose education ceased, when this spirit of universal teaching came forth, will be a stranger to some of the strongest interests in the community, unless he devotes to them some of his time. We know no single volume which will so well answer his purpose as this. The great number and variety of topics treated of in this volume, made it necessary that the account of each should be short. But to obviate the objection that this might give rise to, the author has given at the end of each chapter full referen-

ces to the best works which treat each subject in detail, or at greater length. This is a very useful addition, and may be referred to with advantage by those who have already much knowledge of the topics treated, as well as by the class more particularly adverted to above. As a work of reference the whole volume is peculiarly valuable. Its tables of contents, and its index are so full, that while in the body of the work, we find a classification of subjects, we have in these, facilities not unlike those which an encyclopedia or dictionary affords.

The volume commends itself to the professed teacher. To him it must be invaluable. It is a great text book on which a course of instruction on the arts may be founded which will be absolutely complete. The author has found nothing relative so insignificant as to be passed over with neglect, and has fearlessly hazarded the imputation of triteness, that he may bring together every thing which belongs to his subject. We think this a very important feature of the work, and though in many instances we have little more than a definition, this is so universally a philosophic one, a true generalization, that we get all the knowledge that the plan of the work allows us to expect.

We shall now offer our readers a brief analysis of the contents of this volume, and make some extracts to show the plan of the work. It is divided into twenty one chapters. The 1st treats of the Materials used in the Arts, as they are derived from the mineral, the vegetable, and the animal kingdom. In the II. the Form, Condition, and Strength of materials, are given. The III. treats of Writing and Printing. This is a very interesting chapter, though we cannot but express our regret that the author has not availed himself of the labours of the younger Champollion in decyphering the Egyptian hieroglyphics. These have been eminently successful already, and the zeal and ability which are still continued to this most curious study by the same individual, are an earnest of a far greater success. The latest accounts from this learned and indefatigable traveller add daily confirmation to his earlier views, and increase to him the obligations of all the lovers of antiquity.

Chapter IV. is on Designing and Painting. From this we make the following extracts.

'CHIARO OSCURO.

'Next to correct perspective, the most important circumstance in painting, is the correct distribution of light and shade. To the skilful management of these, we are indebted for the strength

and liveliness of pictures, and what is technically called their *relief*, or the elevation which certain parts appear to assume above the plane upon which the picture is made.

'*Light and Shade.*—Light and shade, as they appear to us upon natural objects, are the consequences of the rectilinear motion of the rays cast upon them by luminous bodies. If an object be exposed to the rays of the sun, or of a single lamp or candle, those parts or surfaces which are presented directly to these rays, become strongly illuminated, and acquire a lighter cast approaching to white. Those surfaces which stand obliquely to the light, receive less of the rays, and of course have a deeper tinge. Those lastly, which are averted from the light, and receive no rays but such as are reflected to them from other objects, acquire a very dark shade, approaching, when contrasted with the others, towards black.

'The distribution of light and shade upon any object, is always proportionate and correspondent to its shape. An even or plane surface, exposed to the sun's rays, will be equally illuminated throughout, since whatever be its position, its parts will all make a similar angle with the rays. But uneven or irregular surfaces will be unequally illuminated, the prominent parts receiving most light, and the depressed portions most shade, an effect which will be increased, if the light falls obliquely or sideways. If the irregularities of surface be sharp and strong, the changes from light to shade, will be sudden, and the contrast great. On the other hand, if they are smooth and rounded, the transition will be soft and gradual.

'*Association.*—As bodies are never seen, except when they are illuminated, the manner in which light and shade are distributed upon them, forms by association a part of our ideas of their shape. Painters have learned to imitate this arrangement of light and shade, by varying the quantity and intensity of their coloring substances, so as to produce in the mind the same associations of shape from a plane surface, as would arise from the falling of light on the original object itself. This art constitutes what is technically called the *chiaro oscuro*, from the Italian words signifying *clear* and *obscure*. Next to perspective it is the most important part of painting, and there are many cases in which perspective alone would wholly fail to convey to us a correct idea of the form of objects, were it not assisted by appropriate insertion of lights and shades. Thus a circle, a sphere, and a cone viewed vertically, may all have the same perspective outline; but their difference of figure becomes apparent, as soon as we consider their distribution of light and shade.

'*Direction of Light.*—The most distinct perceptions of shape are produced when the light falls in one direction, *e. g.* when it is received immediately from the sun, or from a single window or

candle. The distinctness of an object is always impaired, when it is situated between cross lights, or when it is illuminated by a variety of windows or candles on different sides of the room. An object may even be so surrounded with lights, that it shall be impossible to discover its exact shape. Its outline indeed will be discernable, but the equal illumination on all sides, will exclude the existence of shadow, and of course we shall lose the power of appreciating the comparative distance of its parts from the eye. In most paintings, we find that the principal mass of light falls in one direction. An oblique or a sideway direction, is most common, though a front, and even a back light, is managed to produce very striking effects. Painters also exercise their skill with the introduction of cross lights, from different windows, or lamps; but the successful execution of a piece of this sort is more difficult, than with a single light.

'*Reflected Light.*—Owing to the reflection which takes place from all terrestial bodies, we find that objects, in most situations, have not only a principal or direct light, but also a secondary or reflected one. Hence the darkest part of globular and cylindrical bodies, is not that which is most remote from the original light. This part receives from the reflection of objects beyond it, a faint illumination, so that the darkest part will be found between it and the part on which the light directly falls.

'Sharp lights, or such as are intense and sudden, indicate polished surfaces, and are employed to represent them. Where they are accompanied by very deep shades, they express great elevation above the common surface. Faint lights, on the contrary, imply a dull surface, obscure illumination, or small elevation.

'*Expression of Shape.*—Light and shade, are not adequate, in all cases, to give us certain indications of the forms of bodies. Surfaces which appear concave in one direction of the light, may appear convex, if the light is introduced from the opposite side. In contemplating an undulating object, like a curtain, or its picture upon paper hangings, we are often at a loss to distinguish the elevated, from the depressed portions; and by a little effort of the imagination, we can persuade ourselves that a particular part is at one time elevated, and at another, depressed. *Cameos* and *intaglios* may be mistaken for each other, and any of the figures may appear prominent or depressed, in the same part, by reversing the direction in which the light is supposed to strike upon them.

'In cases of this sort, our final ideas of shape are derived, not only from the object itself, but from its relations with contiguous objects.

'*Eyes of a Portrait.*—The influence which the association of contiguous objects has upon our ideas, is strikingly exemplified in

the eyes of a portrait. We estimate the direction of the eyes, not only from the position of the ball in regard to the eyelids, but also from the relative position of the remaining features of the face. Dr Wollaston has shown, that the same eyes in a picture, which looks at us, may be made to appear averted from us, if we apply new features to the lower half of the face. The reason, why the eyes of a portrait appear to follow us, in all parts of the room, is simply, that the relative position of the features cannot change, so that if the picture appears to look at us once, it must appear to look at us always. If we move to one side of a portrait, the change, which happens, is unlike that which would take place in a bust, or living face. The picture is merely foreshortened, so that we see a narrower image of a face, but it is still that of a face looking at us. And if the canvass be transparent, the same effect takes place from the back of the picture.

'*Shadows.* Shadows are cast in the direction opposite to that by which we suppose the light to enter, and their introduction in pictures, always heightens the effect. A painted object, is relieved, or raised from the surface, by the expression of light and shade on itself. But the relief is greatly increased, if the shadow which it makes on the ground, or other surface, be also introduced. Shadows are commonly softened off at the edges, or terminate gradually. When, however, the light is strong, or the shadow very near to the object, its termination is more abrupt.

'*Aerial Perspective.*—This name is given by painters, to the mode of producing the effect of distance, by a diminution in the distinctness and brightness of objects, according to their remoteness from the eye, and the condition of the medium through which they are seen. It is well known, that distant objects appear indistinct, and of a grayish or bluish tinge, from the effect produced by the intervening atmosphere. Their indistinctness is increased, if the atmosphere is hazy. Their appearance is also modified by the degree of their illumination, and by the character of the light which falls on them. The painter, therefore, finds it necessary to consider the depth of atmosphere which is interposed between him and his object, the condition of this atmosphere, and the quantity and color of the light which falls on it, and on the objects. A want of attention to these circumstances, gives rise to the defect called *hardness* in painting.

COLORING.

'By the aid of perspective, and the *chiaro oscuro* alone, very good representations of objects may be obtained. All our common engravings, wood cuts, drawings in India ink, in black crayons, &c., derive their expressiveness from these only. But a still nearer approach to the appearance of nature, is made, by

the employment of *colors* analogous to those which are found to exist in the objects represented.

Colors.—From the science of optics, we learn that the solar beam is divisible into seven primary colors, white being the mixture, and black the privation of all of them. These colors, are violet, indigo, blue, green, yellow, orange, red.* Three of these are capable of producing all the rest, by their intermixture and degree, viz. blue, red, and yellow.

The color belonging to different natural objects, was supposed, by Newton, to be occasioned by a power which their surfaces possess, to reflect certain rays, while they absorb all the rest. This power is so iufinitely diversified in nature, that we find not only every kind of primary ray reflected, but likewise every possible tint, and intermediate grade, which can be produced by the admixture of two or more original colors. To represent these various hues, it is necessary that the painter should possess coloring substances analagous to them all, or capable of producing them all by mixture, and that he should apply them in such a manner, that the true color may remain distinct, independently of the lights and shades necessary to place the objects in relief.

'*Shades.*—In a colored painting of an object which has any rotundity of form, there are usually, at least, three tints, or degrees of color. These are the *light*, the *middle tint*, and the *shade*. Of these, the middle tint is the one which represents the true color of the object, and occupies an intermediate situation between the light and shade. Thus in the painting of a red fruit, for instance the cherry, the middle tint is vermilion, or some similar color, being that which the surface of the fruit would have, if it were perfectly flat. The part of the fruit nearest the light, has a very bright color partaking of white, while the remote parts are shaded with lake or some darker red. In like manner, a yellow fruit, like the lemon, has not only the true color of the rind, but is lightened at the top with straw color or white, and shaded with brown toward the edges. It is necessary that the colors used for dark shading, should be in some degree correspondent with the middle tint, and not diametrically opposite to it. Thus, in single objects, yellow cannot be shaded with blue, nor red with green.

'*Tone.*—Pictures differ from each other in the respective depth of color, which pervades the whole piece. The word *tone*, bor-

* Dr Wollaston found the spectrum formed in looking through a prism at a narrow line of light, to consist of four colors, red, green, blue, and violet, with a narrow stripe of yellow. The three simple colors, red, green, and violet, may produce yellow, by the admixture of red and green; crimson, by red and violet; blue, by green and violet, and white by the combination of all three.

rowed from the art of music, signifies in painting, the peculiar cast, or governing hue, which a picture, or a color, possesses. Thus if dark masses of color, with feeble lights, predominate, the piece has a deep or low tone, while if the reverse exists, a bright or light tone is produced. It is essential to harmony that a picture should have the same tone throughout, or that its lights and shades should correspond in their intensity to the tone which governs the whole.

'*Harmony.*—When different objects are grouped together in the same view, each one possesses two kinds of color, the *original* color, and the *adventitious*. The original color, often called among painters the *local* color, is that which belongs to the object itself, independent of situation. The adventitious color, is that which is reflected upon it from neighboring objects, and which of course depends upon situation. For example, the color of the human face is that which we call flesh color, and, if painted alone, may be represented by the shades of that color. If, however, it is surrounded by a purple drapery, it receives a purplish tinge, and requires to be so represented. In like manner, a yellow dress communicates to it a yellow cast, &c. An attention to this adventitious coloring, combined with a uniformity of tone, constitutes the basis of what is technically called *harmony* in painting. Harmony requires that strong and glaring colors should never be forcibly contrasted with each other, but that each object should partake at its edges of a certain portion of the color which predominates in objects near to it. This rule not only produces effects most grateful to the eye, but an observance of it gives, in fact, the only true representation of nature.

'*Contrast.*—Colors are divided by painters, into the *warm* and the *cold*. Warm colors are those in which red and yellow predominate. Cold colors are blue, grey, and others allied to them. Neutral colors are intermediate tints, or mixtures. Of the various pigments or coloring substances, which painters employ, none have the genuine brilliancy of the prismatic rays; and all fall short of the hues produced by nature in living objects. The petal of a flower, the feather of a bird, and the wing of an insect, are tinged with a richness and splendor, which no factitious colors can equal. Painters can only approach, when necessary, towards the brightness of natural colors, by availing themselves of the effect of contrast, and by heightening one color by the introduction of others, which prepare the eye for its more perfect and favorable reception.

'*Remarks.*—The power of giving true representations of objects, is derived, originally, from an attentive study of the colors and appearance which they actually exhibit in nature; afterwards from a comparison of the success of different artists, and

an attention to the means they have employed. What belongs to the philosophical part of painting, can hardly be said to extend beyond the correct imitation of nature. But the inventive part, the design and composition of great pieces, such as have not necessarily any originals in nature, requires not only philosophic accuracy, and practical skill, but also demands original genius, strength and fertility of imagination, and a strong perception of sublimity and beauty, whether natural or moral. To paint a portrait, or a landscape from nature, requires no more than a faculty of correct imitation. But to express on the canvass a scene of history or of fiction, to create forms of ideal beauty exceeding the realities of life, and to express, by attitudes and lineaments, passions, which tell the events they accompany,—this excellence is attained by few; it is not to be taught by any rules of art, but, like poetry, and eloquence, it is within the reach of those only, whom a strong and exclusive interest in the pursuit, has qualified to feel deeply, and to express powerfully.'—pp. 82--86.

Engraving and Lithography are the topics of chapter V. Sculpture Modelling, and Casting, of chapter VI. Chapter VII. is of Architecture and Building. After a description of the separate objects which belongs to these subjects, the various styles of architecture are described, viz.—the Egyptian; the Chinese; the Grecian; the Roman; the Greco-Gothic; Saracenic, and Gothic style. Chapter VIII. treats of the arts of Heating and Ventilation; Chapter IX. of Illumination.—From this we extract the following.

'*Reflectors.*—For obvious reasons, a lamp yields most available light, when it is placed in the centre of a room, or space to be illuminated. In this situation, if a reflecting surface be brought near to it, this surface by its reflection will increase the amount of light in one direction, at the expense of intercepting it in another, so that the total advantage is not increased by the reflector. But when a lamp is placed near a wall, so that a part of its rays are wasted by falling immediately upon the wall, in this case if a polished surface be placed behind the flame, it reflects back most of the rays, which would otherwise be lost upon the nonreflecting wall; and thus it increases the effect of the light. The familiar fact that rooms with light colored walls are most easily lighted, is owing to the greater reflective power which such walls possess, when compared with darker surfaces.

'*Hanging of Pictures.*—As the surface of varnished paintings has a considerable reflecting power, it happens that when the spectator stands in the way of the reflected light, his eye is dazzled, and rendered incapable of distinctly perceiving the picture. Paintings, therefore, should not be hung opposite to

lights, nor in any situation in which a line drawn from the place intended for spectators will make the same angle with the surface of the picture, as a line drawn from a window or other illuminating point; the angle of reflection being always equal to the angle of incidence. As a general rule, a picture will be in a bad light with regard to a spectator, whenever the image of a window could be seen by him in a looking glass occupying the same place as the picture.

'*Transparency of Flame.*—If two lamps be placed by the side of each other, the flame of the one, when clear of smoke, does not intercept the light of the other, and casts little or no shadow. Count Rumford found that the brilliancy of flame is, in some high ratio, proportionate to its elevation of temperature. If several concentric circular wicks, or several parallel flat wicks, be burnt near together, they produce more light, in consequence of the accumulation of heat, than they would do if burnt separately.

'*Glass Shades.*—To relieve the eye from the glare of light, produced by bright lamps, shades of roughened glass are frequently used. A rough surface upon glass may be produced by grinding it with sand or emery, by corroding it with fluoric acid, or by covering it with powdered glass and exposing it to heat, till the particles adhere. Glass shades have the effect to disperse the rays of light, by the numerous reflections and refractions which they occasion; till at length the light issues from all parts of their surface, and it appears as if the glass itself were the luminous body.

'*Sinumbral Lamp.*—The reservoir of the sinumbral lamp, is constructed on the same general principles with that of the Astral. The ring, however, which holds the oil, is so formed as to oppose the smallest diameter of its section to the rays of light. A large shade of ground glass is used, which nearly incloses the light, and by the different refractions and reflections given to the rays by the ground glass, they escape in all directions, so that there is no perceptible shadow at a small distance from the ring. Reflectors are sometimes added, when it is desired to throw the principal mass of light in one direction.

'*Measurement of Light.*—The following method of measuring the comparative illuminating power of different lights, is founded on the law, that the amount of rays thrown on a given surface, is inversely as the square of the distance of the illuminating body. Place two lights, which are to be compared with each other, at the distance of a few feet, or yards, from a screen of white paper, or a white wall. On holding a small card near the wall, two shadows will be projected on it, the darker one by the interception of the brighter light, and the fainter shadow by the interception of the duller light. Bring the fainter light near-

er to the card, or remove the brighter light farther from it, till both shadows acquire the same intensity, which the eye can judge of with great precision, particularly from the conterminous shadows at the angles. Measure now the distances of the two lights from the wall or screen, and the squares of these distances will give the ratio of illumination. Thus if an Argand flame and a candle stand at the distance of ten feet and four feet respectively, when their shadows are equally deep, we have the square of ten and the square of four, or 100 and 16, as their relative quantities of light. In this experiment the spectator should be equidistant from each shadow.'—pp. 182–184.

Chapter X. of the arts of Locomotion; XI. of the Elements of Machinery; XII. of the Moving Forces used in the arts. From this chapter we offer the following.

'*Sources of Power.*—It is the office of machines to receive and distribute motion derived from an external agent, since no machine is capable of generating motion, or moving power, within itself. The sources from which the moving power applied to machinery is obtained, are various, according to the nature of the object, and the amount of force which is required. Men and animals, water, wind, steam, and gunpowder are the principal agents employed as first movers in the arts. Their power may be ultimately resolved into those of muscular energy, gravity, heat, and chemical affinity. But although these are the sources of all the important force which is artificially employed in moving large masses of matter, yet certain other agents are also capable of producing motion upon a more limited scale, such as magnetism, electricity, capillary attraction, &c.

'*Vehicles of Power.*—Besides the original forces which have been mentioned, there are certain intermediate agents which serve to accumulate and transmit power, after the first mover has ceased to operate. These agents commonly act either by their elasticity, their gravity, or their inertia. Springs and compressed air are examples of vehicles acting by their elasticity, and their usefulness continues only till they have recovered the situation from which they were disturbed by another force. In like manner a weight acting by its gravity on an axle or wheel, prolongs for a season the influence of the power by which it was wound up. Fly wheels are also vehicles which serve by their inertia to continue the action of a force while it intermits. Vehicles of power are highly useful in equalizing the irregularities which are incident to prime movers, in prolonging their action through convenient periods of time, and in multiplying the modes of their application.

'A fundamental distinction among mechanical agents, both original and secondary, consists in this; that in some the inten-

sity of their action, or the acceleration they produce in a given time, is the same, whether the body acted upon be at rest or in motion; in others it is greatest when the body acted on is at rest, and becomes less as its velocity increases. Gravity is the only force which is certainly known to act with equal intensity on bodies in motion, and at rest; though magnetism probably possesses the same property. Every other important power acts more forcibly on a body at rest, than on one which has already acquired motion in the direction in which it acts.* This happens with the strength of animals, the impulse of fluids, and the elasticity of springs.

ANIMAL POWER.

'Muscular energy is exerted through the contraction of the fibres which constitute animal muscles. The bones act as levers to facilitate and direct the application of this force, the muscles operating on them through the medium of tendons, or otherwise. Muscular power is much greater in some animals, than it is in man, owing to their size, or more active mode of life. It is greatest in beasts of prey.

'*Men.*—The power of a man to produce motion in weights or obstacles, varies according to the mode in which he applies his force, and the number of muscles which are brought into action. In the operation of turning a crank, a man's power changes in every part of the circle which the handle describes. It is greatest when he pulls the handle upward from the height of his knees, next greatest when he pushes it down on the opposite side, though here the power cannot exceed the weight of his body, and is therefore less than can be exerted in pulling upward. The weakest points are at the top and bottom of the circle, where the handle is pushed or drawn horizontally.

'If a windlass be provided with two cranks placed at right angles with each other, two men will perform much more work, than they could if the cranks were disconnected, because at the moment one puts forth his strength to the least advantage, the other is exerting his with the greatest effect.

'The mode in which a man can exert the greatest active strength, is in pulling upward from his feet, because the strong muscles of the back as well as those of the upper and lower extremities, are then brought advantageously into action, and the bones are favorably situated by the fulcra of the levers being near to the resistance. Hence the action of rowing is one of the most advantageous modes of muscular exertion, and no method which has been devised for propelling boats by the labor of men, has hitherto superseded it.

'According to Mr Buchanan, the comparative effect produced by different modes of applying the force of a man, is nearly as

* See Playfair's Outlines of Natural Philosophy, vol. i. p. 107.

follows. In the action of turning a crank, his force may be represented by the number 17. In working at a pump, by 29. In pulling downward, as in the action of ringing a bell, by 39. And in pulling upward from the feet, as in rowing, by 41.*

'In estimating the different applications of animal force, we must take into consideration not only the resistance they can overcome, but the velocity with which they move, and the length of time for which they can be continued. Violent efforts are not true specimens of a man's labor, since they can be exerted for a short time only. A moderate computation of an ordinary man's uniform strength, is, *that he can raise a weight of* 10 *pounds to the height of* 10 *feet once in a second, and continue this labor for ten hours in the day.*† This is supposing him to use his force under common mechanical advantages, and without any reduction for friction.

'*Horses.*—Horses are often employed as movers of machinery by their draught. A horse draws with greatest advantage when the line of draught is not horizontal, but inclines upward, making a small angle with the horizontal plane, as already stated, page 197. The force of a horse diminishes as his speed increases. The following proportions are given by Professor Leslie for the force of the horse employed under different velocities. If his force when moving at the rate of two miles per hour, is represented by the number 100, his force at three miles per hour will be 81,—at four miles per hour 64,—at five miles 49,—and at six miles 36. These results are confirmed very nearly by the observations of Mr Wood.‡ In this way the force of a horse continues to diminish, till he attains his greatest speed, when he can barely carry his own weight.

'Various estimates have been made of a horse's power, by Desaguliers, Smeaton, and others, but the estimate now generally adopted as a standard for measuring the power of steam engines, is that of Mr Watt, whose computation is about the average of those given by the other writers. The measure of a horse's power, according to Mr Watt, is, *that he can raise a weight of* 33000 *pounds to the height of one foot in a minute.*

'In comparing the strength of horses with that of men, Desaguliers and Smeaton consider *the force of one horse to be equal to that of five men;* but writers differ on this subject.

'When a horse draws in a mill or engine of any kind, he is commonly made to move in a circle, drawing after him the end of a lever which projects like a radius from a vertical shaft. Care should be taken that the horse-walk, or circle, in which

* See Brewster's Edition of Ferguson's Mechanics, vol. ii. p. 9. The whole numbers are 1742, 2856, 3883, and 4095.

† Young's Lectures on Natural Philosophy, vol. i. p. 101.

‡ Treatise on Rail Roads, p. 293.

he moves, be large enough in diameter, for since the horse is continually obliged to move in an oblique direction, and to advance sideways as well as forward, his labor becomes more fatiguing, in proportion as the circle in which he moves becomes smaller.

'In some ferry boats and machines, horses are placed on a revolving platform, which passes backward under the feet whenever the horse exerts his strength in drawing against a fixed resistance, so that the horse propels the machinery without moving from his place. A horse may act within still narrower limits, if he is made to stand on the circumference of a large vertical wheel, or upon a bridge supported by endless chains which pass round two drums, and are otherwise supported by friction wheels. Various other methods have been practised for applying the force of animals, but most of them are attended with great loss of power, either from friction, or from the unfavorable position of the animal.'—pp. 253–257.

Chapter XIII. treats of the Arts of Conveying Water; XIV. Arts of Dividing and Uniting Solid Bodies; XV. Arts of Combining Flexible Fibres; XVI. Arts of Horology; XVII. Arts of Metallurgy; XVIII. Arts of Communicating and Modifying Colors; XIX. Arts of Vitrification; XX. Arts of Induration by Heat; the XXI., and last chapter is on the Preservation of Organic Substances.

ART. IV.—*Remarks on the Duty of States in regard to Public Education.*

A SYSTEM of education which may give to every member of American society, a portion of knowledge adequate to the discharge of his duties as a man and a citizen of the republic, is essential to the advancement of private interest, the maintenance of public virtue, the due appreciation of talents, the preservation of a sacred regard to principle, and of a high tone of moral sentiment. A system which affords to such as are endowed with superior capacities, the means of making proportional attainments, is also intimately connected with the interest of the nation at *home*, through those who administer, and *abroad* through those who represent our government;

with the extension of just and liberal opinions in relation to the effect of free governments; with the union and fraternity subsisting between the members of the confederacy, and with the general character of the nation for liberal sentiments and grateful recollections.

If these statements be just, we are led to ask under what *authority* the blessings of learning are to be secured to the nation? The government of the Union has manifested no decided inclination to act efficiently in the matter. And as the legislative department has shown no disposition to exercise its acknowledged powers, in relation to this subject, even within the district where it possesses sole dominion, it is not to be expected that the same power should be extended over the whole nation, where a *plausible*, at least, if not *valid* Constitutional objection may be raised against its exercise;—and much less are we to suppose that the concerns of education will supersede, in the minds of *executive* officers, the great subjects of war and peace, of commerce and revenue, of foreign embassies and international relations. These great, absorbing interests will of necessity continue to engross the attention and speculations of the active, aspiring candidates for public distinctions and emoluments. Happy will it be for the community, if those whom it delights to honour with a station in this department, shall *themselves* be at all times found experimentally acquainted with the advantages of a sound and finished education, united with commanding talents, and an integrity above suspicion. A statesman with these qualifications cannot fail to exercise an important indirect, if not immediate influence on the standard of taste, knowledge, and refinement throughout the land, and to stimulate by countenance and example what he may not be able to support by positive legal provisions.

In proportion, however, as knowledge, whether elementary or profound, is to be regarded as a blessing, in the same degree is the want of it, to be esteemed a misfortune. Each and every portion of this Union has therefore an interest in the success of every effort to diffuse the means of education, separate from any calculation of profit and loss, and from any reference to the great and momentous national concern, already mentioned as involved in this subject. Indeed there are various interests besides that of ed-education, in which the nation at large has a deep stake; yet the general legislature cannot, consistently with its prescribed powers, materially interfere. Such are the encouragement of agriculture, the bestowing of charters for local establishments, whose effects,

notwithstanding, are felt far beyond the sphere of their immediate operation. Adverting to the manner in which *these* interests are, and must continue to be managed among us, we are furnished with an answer to our inquiry by what authority the benefits of learning are to be conferred on the whole American community. The separate State legislatures, have in several instances already practically settled the question, by a long course of legislation on the subject. Others have contented themselves with partial, inconsiderable efforts applied to a class of persons not the most likely to appreciate the blessings of knowledge, and least disposed to acknowledge an obligation which places them in a degraded relation to their fellow citizens. A third class of States are still wavering between a resolution to provide an efficient system of education for themselves, and a vague, perhaps a vain, hope, that something may still be expected from the liberality or the justice of the general government, towards this object. We cannot refrain from expressing in this place the admiration excited by the policy of one enlightened State, which, while engaged in an enterprise for internal improvement, the grandest that our country has ever witnessed, perhaps that the genius of man has ever devised, simultaneously erected a system of *universal* as well as *liberal* education, by means of which more than eight thousand ordinary, and numerous superior seminaries are put into operation, and more than 400,000 youths of both sexes are annually admitted to the inestimable blessings of either solid or useful, or polite and finished education. To estimate justly the immense influence of that amount of talent which will thus be brought from a dormant to an active condition, is perhaps beyond the power of calculation.

To behold its full display, we must search every cottage and farm house as well as every mansion, for the energy and enterprise, united with the firmness and sobriety of character which it has developed; we must note the change from a devotion to material life and animal gratifications, to a pursuit of intellectual speculations; we must penetrate, in short, every bosom made in any degree capable of being warmed by the radiance of genius, or filled with loftier and purer sentiments.

An apprehension has sometimes been indulged, that the interests of the several States would become merged and lost in that of the confederation. Nothing is better fitted to preserve the distinct individuality of the States, than reserving to themselves the superintendence of the concerns of education. Not

only will the thoughts and opinions of the inhabitants of each State then possess a distinctive peculiarity, but the feelings, biases, and mental associations, will also be found to retain a strong binding force between the individual and his native State. The *earliest* impressions are to a great majority of mankind the strongest that they ever realize. As when these impressions are made with the seal of virtue, they remain the pledges of future excellence; so when they are derived from circumstances in our social condition that possess genuine worth, or from institutions which assist to confer that worth, they enchain the affections with a force which no subsequent changes of fortune can sever. The attachment to our native State which we thus derive from her institutions for education, is, however, perfectly consistent with an enlarged patriotism embracing within its circle every portion of our country, as well as with a liberal philanthropy that extends its good wishes, and would extend its good offices to every member of the human race. Indeed one of the first effects of a liberal system of education, on the minds and feelings of a community, is a display of more extended benevolence, of a less niggardly parsimony, of a magnanimity that can embrace sublime conceptions, of a patriotism that regards the greatness and glory as well as the quiet and happiness of the nation; and both the one and the other, are paramount to the petty profits, mean devices, and sordid calculations of mere self-interest.

But perhaps it will be contended, that if a State possess eminent physical advantages, enjoying a salubrious climate, a productive soil, navigable streams, and profitable mines, these may suffice to insure her rank and respectability among her neighbours. But let us not deceive ourselves. Mankind are not to be imposed upon by these substitutes for true greatness. They will not accept the vain display of acres and roods of arable, pasture, and woodland, as clear evidence of the *greatness* of a State. They are not yet such converts to the doctrines of *materialism* as to fancy that the spirit and intellect of society are wholly dependent on matter of any sort, and least of all on lifeless, brute matter, for their efficiency. A State may, with all these physical capabilities, proceed in a monotonous course of pecuniary prosperity, as injurious to its moral purity and its mental activity as the severest visitations of calamity. But this course can terminate in nothing but weakness. Animal gratification may be as abundant, uninterrupted, and in-

tense as the grossest appetite could desire, and yet nothing may be added to the permanent reputation of the State.

The destiny of man is for activity and improvement; the destiny of *states*, that would maintain a respectable rank, is for activity and improvement. Without this character of progressive advancement any single State must soon feel its relative degradation, must feel, (if there be a feeling in the community,) the mortifying sense of insignificance.

Unless, then, the moral and intellectual eminence of a great state, correspond to its physical advantages, the latter rather redound to its disgrace than to its credit. The lover of his country walks by the streams and mountains of his native land, and asks himself what are the destinies of this physical Elysium? what are the glorious realities to which the sages and bards and patriots of our country have, for the last half century, been aiming the labours of their hands, the energies of their minds, the glow of their eloquence, the inspiration of their verse? Is it to witness these vales which might vie with Tempe in amenity, these rivers to which Peneus and Tiber are but puny rills,—swarming with hordes of mere grovelling worms in human shape? to see these noble forests levelled to give place to a rank and poisonous growth of sleeping plants, with the form only of God's image—breathing only to exhale a moral pestilence—and to turn into a pandemonium what might otherwise be a paradise?

The question presses itself on the whole, and on every part of the nation, whether our citizens shall dream away existence in inglorious ease, following the blind impulses of animal passion; whether they shall pursue the servile track of imitation, from age to age; whether they shall say, and believe, and do, just as much and no more than their fathers; or whether they shall obey the dictates of sound reason, adopt the results of faithful experience, be alive and awake to the dearest interests of humanity, as well as to all the beauties and glories of nature by which they are surrounded; whether they shall strike out new paths in which to mount to perfection; whether they shall have a political, a philosophical, a moral, and religious faith of their own, unbiassed by the absurd and arbitrary dogmas of sophists and demagogues and bigots on the one hand, or of libertines, disorganizers, radicals, and infidels on the other?

These are questions on which each separate State of this Union, which has not already settled the point, is deeply interested in deciding; inasmuch as on the promptitude and cor-

rectness of the decision, depends in a great measure the prosperity of its present and the character of its future generations. Those States which shall have the wisdom and foresight to adopt sound and salutary systems of public education, will no longer feel the mortification of being regarded as the objects of derision to a whole nation, the more awkward and ridiculous, in proportio nto their superior bulk. Their chief magistracy will be honourable and independent, because well informed constituents will know their own dignity to be degraded when their sovereign authority is delegated to the hands of drivelling imbecility. Their courts of justice will be upright, learned, and wise, because their decisions must be submitted to the scrutiny of a cerning public, the humblest member of which can detect errors, inconsistencies, and partialities. Their statute book will not exhibit a tissue of clumsy enactments, each vieing with its predecessors in absurdity, because ignorance will no longer be deemed an essential requisite in a legislator. Their cities will echo to the voice of honest labour, greeted with the frequent interchange of courtesies and kindness. Their sons shall be distinguished for elevated sentiments, raising them equally from that sordidness which stoops to grasp at petty dishonest gains, and from that contemptible pride which shrinks from a pursuit of honest and industrious callings; while their daughters shall be regarded with that sacred delicacy which revolts at the thought of an unhallowed purpose, and with that chivalrous pride which scorns to impose on them the menial of fices of life. J.

ART. V.—*Address to the Members of a Society, on the plan of a Lyceum, in one of the Western States.*

AGREEABLY to your request I would offer for your consideration such ideas as occur, on the utility, introduction, conduct, and management of a society for improving your own minds, and amending the present course of instruction of your children.

It is certainly encouraging to see ladies disposed to avail themselves of all the facilities for improvement afforded by the liberality of enlightened society. To females these privileges have been greatly multiplied within this last half century. Yet

I presume it is not contemplated to establish and conduct a society of this kind without the concurrence, advice, and assistance, and indeed the direction and management of the other sex. Men, besides the advantage of a more scientific education, are more accustomed to this kind of things, and perform all business-like affairs with more ease and accuracy ; and by their education and experience, the imagination is chastised into somewhat more reasonable limits ; and they pursue measures better calculated for permanency than the more ardent temper of woman usually permits. But the meeting of these opposite electricities may produce a mental action that no quantity, however great, of one kind alone would be able to effect. Husbands and wives, sons and daughters, brothers and sisters, I conclude, are to share the labours, profits, and pleasures of your association.

The first requisite must be provision for the pecuniary demands. Let a fixed price be annexed to the privilege of membership, and gratuitous subscriptions collected for procuring books and other apparatus, for illustrations and experiments ; an additional quarterly tax to be imposed for defraying incidental expenses, and procuring periodical and other new publications, as they come out. And, moreover, as you can hardly expect ever to become able to bear the expense of so extensive an apparatus as to meet all the desired subjects of application, it seems desirable that you encourage, by every practicable measure, the formation of societies of a similar character in the several villages in your region of country ; and that you establish, through committees or delegated correspondents, an intercourse for the mutual exchange of books and apparatus, and the repetition of lectures and other instruction ; diminishing the expenditures, whilst increasing the advantages to all.

I cannot propose any specific regulations, merely suggesting that the exercises be as various as may consist with utility, encumbered with the fewest possible formalities. Curiosity and interest must be kept alive. This is not to be done by mere conviction of usefulness. Though proud of considering ourselves rational creatures, it must be remembered that we are but intellectual animals, materially and mentally subject to similar laws, and cannot subsist but by often repeated stimulus ; that nothing is effectually done or attained that is not pursued with a degree of passion or fervour. It is the overlooking this principle of excitability and the necessity of continued stimulus, that seems the chief cause why so many associations for men-

tal improvement have had but an ephemeral existence. When their several rules have been 'conned by heart and acted out,' the novelty ceases, the excitement subsides, the system languishes, the body dies, and that a natural death, though perhaps of few months' existence.

The exercises may sometimes consist of regular lectures; sometimes essays, or other short compositions may be read in the club, with intervening meetings for familiar conversation. There is no general easy mode of instruction at the same time so useful, pleasing, and permanent, as sprightly, sensible, enlightened conversation. For the management of this, the principal direction requisite, is that given by the apostle to the early Christians, to 'let one speak at a time;' but between this and lectures there is an intermediate course, more difficult than either to regulate, but more valuable, as it more necessarily brings into exercise the mental energies of the several individuals; an object of primary importance in every species of instruction. This course must consist in different members alternately epitomizing and recounting their course of reading from one meeting to another. Let a certain number, whom abilities and leisure may best qualify for the office, be selected, and the writings of different authors on any given subject, or illustrative of it, be put into their hands for perusal, to be reported and discussed at the next meeting. After one reader has related the nature, conduct, principles, and opinions of the work perused, and made his own remarks thereon, any other member may make comments, or criticisms, or ask questions, &c.

Having gone through with one author, another reader will proceed in similar manner; thus running over the several works assigned for the exercise of that meeting, and collecting whatever appears most valuable and practical from all. We may suppose the management and instruction of children to be the subject of several such exercises. Would not several amendments in our own practice be rendered obviously necessary and practicable? Suppose, again, that historical information be the object of another course. For facilitating it, let there be appointed some one to deliver lectures on the most profitable manner of pursuing it, pointing out the most important objects of observation and research; or, in the manner above recommended, one member may read a volume on the subject by one author, another member peruse a different author, making an abstract of their opinions, recommendations, and directions,

for the general information. Priestley, Volney, Bigland, and various others will be found useful in this pursuit.

In entering on an historical course some particular epoch should be selected, and the history of one people assigned to one reader, whilst another member peruses that of another people; civil history, to be read by one, church history by another; any works of science, philosophy, or taste, illustrative of the state of society, customs, manners, &c., of the same period, should be examined in connexion with the general history, that the state of all the cotemporary nations may be brought into one concentrated view. That more extensive knowledge may be thus obtained by persons having little leisure, than can be done by solitary reading, must be sufficiently obvious; attended with less labour and far greater pleasure and profit.

To young persons wholly unacquainted with history, the most useful and most interesting method is to commence with the personal history or biography of certain distinguished actors in the political world, as a Washington, a Franklin, a Lafayette, or a Bonaparte; and having read such memoirs, to peruse the history of the time and people with whom the subject was an actor. Curiosity is naturally led thence to inquire into the state of such people previous to those events. Having in this manner run backward through American and English affairs, with a general sketch of Europe for the last century, the young mind is better prepared to take hold of the more stately volumes of philosophic and ancient history. Whenever ancient history is attempted, resort must be had to every species of information for ascertaining the state of civilization, customs, manners, arts, science, philosophy, and religion, of any people; bringing into comparison the different nations of the earth. After several historical meetings, let them be succeeded by others for experiments and illustrations of the principles of philosophy, science, and arts; or by exhibitions of the fine arts, ancient relics, natural curiosities, &c. As often, at least, as once a month something new must be devised. Stimulus (beyond the mere sustenance of existence) must be varied, or it loses all salutary effect. The reading and criticising poetry, with other works of taste, may constitute another variety; illustrating their spirit, their conduct, and power of pleasing. Every body reads Milton, and almost everybody Shakspeare; yet how small a proportion of readers understand and relish any thing of the ingenuity, art, and invention of the poet! Periodical

essays, or miscellaneous papers, descriptive of men and manners of any age, will also be found pleasing, and not without their uses.

The occasional writing of themes or essays, by individual members, for the instruction and amusement of all, is likewise to be recommended. And, should your society like to acquire manly vigour for 'the gymnastic exercises of the mind,' works of mental philosophy, I trust, will find their way into your library, and be read with advantage. We cannot expect to make great advancement in improving the mind whilst unacquainted with the nature and exercise of its several powers. It is the investigation of principles and influences, and their mode of operation that I intend by mental philosophy. Moral philosophy, properly speaking, should enter into every species of instruction; but I could wish that we possessed (or at least that I knew that we were in possession of) some treatise immediately upon that subject, more practically operative than our common classic works that fall under that denomination. It is not a work to tell us what is the essence of morals, or why we are obliged to do right, that is the desideratum; but something to teach youth by what course of observation, reflection, and conduct, good feelings may be substituted for perverse or angry ones, to show them how kindly sensations are to be produced and sustained in themselves, and how they constitute happiness; and how the sordid gratifications prove their own torment, and how the social affections bring their own abundant reward. No one does evil for the pure love of producing pain, and could persons of bitter, selfish dispositions understand how their own misery is thus enhanced, and how 'by giving liberally one increaseth in riches,' would not their feelings assume a more benevolent character?

I must be permitted to offer a caution that you set not expectation too high. Very brilliant effects are not at once to be expected from any combined efforts. Yet so essential is social intercourse, not alone for obtaining information from others, but for evolving from their native napkin one's own talents, and for sweetening all intellectual exercise, that philosophers have concluded that any one condemned to absolute solitude, where mental entertainment would seem essential to comfort, would, nevertheless, lose all relish for books and literature, though from them had previously flowed his highest gratification. He would rather devote himself to whistling to a cricket, and feeding a mouse or a spider. If habits of society be so indispensable to

mental existence, they are not less so for ascertaining the character and strength of one's powers by comparison with others. From all these considerations the advantages of associations would seem incalculable ; or at least to be estimated only by rule of permutation, multiplying the original conceptions, suggestions, and effusions of each individual mind into those of all the others.

ART. VI.—*New Work on the Art of Teaching.*

THE Reverend S. R. Hall, Principal of a seminary in Concord for the instruction of teachers, which has already furnished a large number of instructers of both sexes for the States of Vermont and New Hampshire and the adjoining British dominions, has prepared a course of lectures on the art of teaching, which is in press, and will shortly be published by Messrs Richardson & Lord, of this city.

After an examination of the work in manuscript, we have no hesitation in saying that it will prove an invaluable manual for instructers, particularly those who are just entering upon the arduous business of conducting a school. It contains, moreover, a great deal of matter which is particularly deserving of the attention of school committees and parents, as it points out with great force and precision, their duties in relation to instructers and schools.

The leading subjects embraced in the lectures are as follows:

LECTURE I.

I. *Obstacles which tend to prevent the Usefulness of Common Schools.*

1. Indifference of parents to the importance of instruction.
2. Unwillingness to attend school district meetings.

LECTURE II.

Obstacles which prevent the Usefulness of Schools, continued.

3. Unwillingness to provide apparatus and books.
4. The existence of parties and the prevalence of party spirit in school districts.
5. A disposition among the more wealthy citizens to send their children to private academies.
6. A want of Christian effort to raise the moral character of schools.

7. A deficiency in the qualifications of instructers.

8. Unwillingness on the part of school districts to make adequate compensation to instructers of approved talents and qualifications.

9. A want of books adapted to the capacities of children.

10. Inconvenience of school rooms.

Lecture III.

II. *The requisite qualifications of Instructers.*

1. Common Sense.
2. Uniformity of temper.
3. A capacity to understand and discriminate character.
4. Decision of character.
5. A schoolmaster should be affectionate.
6. He should possess a just moral discernment.
7. A thorough knowledge of the branches required to be taught in district schools, and of the elements of natural and moral philosophy and chemistry, and of the constitution of the country.

Lecture IV.

III. *Practical Directions to Instructers.*

1. Endeavour to become acquainted with the nature of your employment.

Importance of this to the enjoyment and usefulness of the teacher.

Means of acquiring this knowledge.

1. By reading works on education.
2. By reflecting on the common nature of children.
3. By studying the varieties of character among parents.
4. By conversing with experienced teachers.

2. Consider the responsibility of your office.

Lecture V.

Practical Directions to Instructers, continued.

3. Endeavour to ascertain by what means you are to gain that ascendancy over your pupils which is necessary in order to confer on them the highest benefit.

1. Convince the scholars that you are a real friend to them.
2. Be not hasty.
3. Never speak angrily nor scold.
4. Be punctual in every thing.

4. Be willing to devote your time to your school and strive to make the most judicious use of it.

Lecture VI.

Practical Directions to Instructers, continued.

5. Govern your school, and in order to do this effectually govern yourself.

In governing,

1. Determine to have order in the school.
2. Treat your pupils as reasonable and intelligent beings.
3. Let your government be uniform.
4. Let it be characterized by firmness.

Lecture VII.

Practical Directions to Instructers, continued.

5. Let the government of your school be impartial.

6. Consult the future and permanent welfare of your pupils in your mode of government.

Remarks on the mode of investigating conduct and punishing offenders.

1. Never be in haste to believe that your scholars have done wrong, and be not in haste to accuse them.

2. Never punish for a fault until its nature and criminality are understood by the culprit.

3. Decide on such a mode of punishment as will be most likely to benefit the pupil and prevent a repetition of the offence.

4. Always make the punishment effectual in humbling the offender.

Administration of Rewards.

1. Promise no rewards.
2. If given let them be rewards of exertion, not of talent.

Lecture VIII.

Practical Directions, continued.

6. General Management of schools.

1. Endeavour to adopt such a course as shall render the school pleasant to the members.

2. Reduce every thing to system.

3. Let every exercise be done thoroughly and faithfully.

4. Let subjects receive attention in proportion to their real importance. Some instructers devote too much time to a small class occupied with a favourite study.

7. Direction of Studies.

1. Begin with the most simple and intelligible branches.

2. In advancing, give the preference to those branches which will be most useful in the business of life.

LECTURE IX.

Practical Directions, continued.

8. Mode of Teaching.

1. Regard the subject more than the text book—things more than words.

2. Let it be your object to have every subject of study thoroughly understood by the pupil.

3. Use the most simple modes of illustration.

4. Make every study as pleasant as possible to the pupil.

Directions for instruction in Spelling.

Directions for instruction in Reading.

LECTURE X.

Practical Directions, continued.

Directions for instruction in Arithmetic.

Directions for instruction in Geography.

Directions for instruction in English Grammar.

Directions for instruction in Writing.

Directions for instruction in History.

LECTURE XI.

Practical Directions, continued.

Instruction in Composition.

Remarks on improving favourable opportunities for making impressions on the minds of pupils, such as natural phenomena, incidents in history, providential events, &c.

LECTURE XII.

Practical Directions, continued.

Remarks on the methods of engaging the attention of pupils to their studies.

Discussion of the question whether emulation and ambition should be used as stimulants to study.

On the means to be employed for stimulating the exertions of pupils.

1. Present the importance of knowledge and mental improvement as qualifications for respectability, usefulness, and happiness in future life.

2. Approbation of friends and instructers.

3. Love of learning for its own sake.

4. Moral obligations.

LECTURE XIII.

Practical Directions designed particularly for the use of female instructers.

It will at once be seen that the subjects discussed by Mr Hall are of the most interesting and practical nature ; and it is

but justice to him to say that the above abstract presents but a meagre account of the rich variety of useful and practical matter contained in his lectures. We shall embrace an early opportunity, after the work is published, of reviewing it and presenting such extracts as will furnish a fair specimen of the author's style and manner of discussing these highly interesting subjects.

ART. VII.—*A New System of Geography, Ancient and Modern, for the Use of Schools, accompanied with an Atlas, adapted to the Work. By Jedidiah Morse, D. D. and Sidney Edwards Morse, A. M. Twenty Sixth Edition.* Boston. Richardson & Lord. 1828. 12mo. pp. 323.

IT may seem to be rather a late hour for us to take up the review of Morse's Geography; and we should deem some apology necessary for having neglected it so long, did we not know that our readers are aware of the necessity we have hitherto been under of bringing forward what was new and unknown, instead of following in the track of public opinion and adding our sanction to what had been long known and approved. Our notices of new works have been so full and particular that we are now at leisure to examine some of their predecessors; and we feel that it is but justice to begin with one of our earliest and most successful authors in the department of school books.

We consider Doctor Morse and his coadjutor in the present work as advancing two distinct and well founded claims to public patronage. In the first place, Doctor Morse was emphatically and truly the Father of American Geography; and in the second place, he has kept up with the age in the progress of improvement. Not that he and his coadjutor have copied the improvements of others in our country; for it appears that the latter distinctly claims the merit of originating independently the system of general and comparative views, used by Mr Woodbridge and Mrs Willard, without denying them the same merit; and the interrogative system of Gay and Goldsmith was promptly adopted as soon as their works became known here.

'"The general and comparative views," says the junior editor, in his preface to the twenty sixth edition, 'form only one feature of our improvement. The whole plan embraces three things. 1. *Outline views* of the globe and its grand divisions. 2. *Connected descriptions in detail* of the different countries or parts of each outline. And 3. *Recapitulatory or general and comparative views.* This is the plan which the mind requires in order to the easy performance of its task.—After having described very briefly the shape and size of the earth, and its relations to other parts of the universe, the pupil should be presented with a brief outline of the surface of the whole globe; consisting of little else than the names and relative position of its oceans, continents, and grand divisions. He is then prepared to commence immediately the study of some one of these divisions—North America, for example—and here, he should be presented with another outline, exhibiting the prominent features of the country, such as the mountain ranges, the great river lines, the principal bays and gulfs, the long chain of lakes, &c., in describing all which, care should be taken to introduce no names which will not be immediately intelligible to the pupil. Such a view will prepare him to come with advantage to the study of the descriptions of particular countries, and any further introduction to these descriptions, we conceive to be entirely unnecessary. The plan of beginning elementary treatises of geography, with general views of the animal, mineral, and vegetable kingdoms, of the various races of men, degrees of civilization of different nations, &c. we conceive, is wholly wrong, because, in giving such views, there is a constant use of the names of countries, people, and places, with which the pupil has not yet been made acquainted. The object of every introductory view, in an elementary treatise, should be to make the succeeding parts of the work more intelligible. It is, therefore, highly improper to insert here what cannot be understood, till the pupil has arrived at the close of the volume.

'The same observations apply to the second head of our plan —*the descriptions in detail of different countries.*—Here also, there is an order to be observed, there is a connexion and dependence of the various heads, which make it proper that they should follow each other in a particular succession. This has been heretofore much neglected by all geographical writers. Towns, rivers, mountains, canals, &c. are thrown together without any reference to the proper order of description, and thus the student is compelled to go over the account again and again, before he can get a connected view of the whole country. We have endeavoured to avoid this error. For example, in the account of Spain, p. 196, after naming the boundaries, divisions, and capes, we give a connected view of the great mountain ranges, showing how they all spring from the Pyrenees, and diverge into different parts

of the peninsula. The rivers are described after the mountains and in reference to them, because the course in which they run is determined by the ridges, each great river draining the country between two of the mountain ranges. Cities come after rivers, because in describing the position of some of the cities, we have occasion to name the rivers on which they stand. Thus, instead of a mass of names and things, having no perceptible connexion with each other, the pupil finds that he can put them together in a regular series, and often that he can reason from one to the other. Thus natural associations are formed, which aid the memory, and the acquisition of knowledge in this way becomes easy and delightful.'

The method here presented of conveying a notion of the general features of a country is excellent ; and the plan of examining pupils in outline maps, by way of general review, will be found to furnish an admirable means of testing their proficiency.

One of the worst difficulties for pupils in the study of geography arises from the dry, uninteresting manner in which the facts are recorded in the text books, and from the continual repetitions which are permitted to occur in them. From these defects the present work is remarkably free ; the style is easy and unaffected ; and wherever it can be done with propriety the names of places are connected with some striking historical association, or some interesting fact in natural history. Care is taken, moreover, that the same description should not be applied to a thousand different towns. The instructer who has ever used a text book of a different character will know how to appreciate these points of excellence.

On the whole, whether we consider the number of improvements embraced in the present work, the amount of information contained in it, the ease and purity of its style, or the neatness and accuracy of its execution both in the text and the maps, we must assign it a high rank among school geographies ; nor do we intend any disparagement to its numerous competitors, when we say that, although with reference to some particular points it may be excelled by one or more, yet considered with regard to its various improvements taken collectively, it is inferior to none of them. It is this general excellence which has enabled Morse's Geography to maintain its ground amidst a host of new competitors in an age of novelty and change, and which will continue to secure it an extensive circulation wherever books are tried on their own merits.

ART. VIII.—*The Mercantile Arithmetic, adapted to the Commerce of the United States, in its Domestic and Foreign Relations. With an Appendix containing Practical Systems of Mensuration, Guaging, and Book-keeping. A New Edition, revised and improved. By Michael Walsh.* Boston. Richardson & Lord. 1823. 12mo. pp. 416.

WALSH's Arithmetic is one of those time-honored works whose fame rests upon their every day utility. It is found not only in the school-room, but in the compting.house, and the ship's cabin. The lad, who has used it at school, retains it in after life, and refers to it as an undoubted authority in the transactions of commerce, and the young adventurer who goes to seek his fortune in foreign lands, puts his Walsh in his chest to serve at once as a guide to the money transactions of other countries, and a memento of home and the laughing days of school-boy happiness.

In the present improved edition, Mr Walsh has introduced several important additions, as appears by his title-page, but has not availed himself of Pestalozzi's system of mental arithmetic. This is as it should be. He thus yields the place of a first book in numbers, to those books which furnish instruction on the new system, and reserves to his own work the place which it will long continue to occupy, that of a sequel to mental arithmetic and practical preparation for the compting-house.

The merchants have complained loudly that boys who were sent into their service, after having studied arithmetic, algebra, geometry, &c., on the purely scientific and philosophical plan, without having been exercised freely on practical questions, had come to their business utterly unprepared, and were continually making blunders in the most common details of trade; while those who had gone laboriously and faithfully through Walsh, were completely *au fait*—up to the active transactions of commerce.

We can readily believe this. It is no more than a commentary on the old adage that, 'practice makes perfect.' A youth who has satisfied himself with learning the philosophy of arithmetic and applying its principles just enough to determine their abstract truth, cannot so readily become an expert salesman and accomptant, as one who has patiently wrought out a complete series of practical questions. Still we say, let the philosophy of arithmetic be carefully studied; let the boy be

thoroughly exercised on the mental plan ; and then, as a preparation for business, let him go carefully and faithfully through Walsh. He will do it in half the time that used to be occupied before mental arithmetic was introduced into our schools ; and he will find it rather a pleasing than an irksome task. When this practice shall prevail extensively, we shall have no more complaints from our merchants, that mental arithmetic unfits boys for the compting-house.

Art. IX.—*The 'Expositors.'*

There is a practice which has ceased, in a great measure, in New England, but continues to prevail extensively in the Middle and Southern States, to the great hindrance of sound education and the incalculable waste of precious time. We allude to the practice of *requiring children to commit dictionaries and abridgments of dictionaries to memory.* In many schools children are required to commit the definitions contained in a small duodecimo, called the '*Expositor*,' from the time when they are able to learn a column or even half a column of them, to the period when they leave school and enter upon the business of life. They finish the book in something less than a year, when having, of course, forgotten the former part of it, they begin again, and the process goes on in this manner till their 'education is finished,' as the phrase is, and they abandon the study of *words* to commence that of *things*.

But this is not the worst of the business. The definitions contained in most, if not all the 'Expositors,' are not only imperfect, but generally wrong, and frequently the most whimsical imaginable, having no perceptible connexion with the real meaning of the word. Fortunately for us in New England, there are none of these books to be found here, so that we cannot at this moment furnish examples of the truth of the above assertion ; but we would recommend to any of our readers, who are in want of amusement, to send to the South, or, if he lives there, to send to any bookstore for a school Expositor, and if he does not find many of its definitions a better antidote for low spirits than any jest book, from Hierocles to Joe Millar, we will forfeit all our claims to a true perception of the ridiculous.

The inquiry naturally arises with any one who has never been accustomed to such things, why children are required to waste their time on such an unprofitable study? What is the apology offered by parents and instructers for suffering such a Gothic practice to exist? The reply is, that it is of vast importance for a child to know the meaning of words. True; but the first step towards a knowledge of the true meaning of words is to study the *nature of things*. To define one arbitrary term by another arbitrary term, does not furnish the means of increasing the pupil's knowledge, but it enables him to appear to know more than he does. The Expositor says nothing of the nature of the things mentioned in it—it does not even furnish any clue to the etymology of the words; but in nine cases out of ten, the term given as a definition is as unintelligible to the child as the term defined—often more so, and the memory is tasked and burdened, year after year, without increasing the stock of ideas or developing the powers of reasoning, or even teaching the meaning of words so much as might be done by half a dozen familiar lectures on natural philosophy, or the reading of a popular treatise on any of the useful sciences.

'But the child,' says the parent or teacher, 'must learn the meaning of words, must acquire a stock of words for the purpose of conversation and letter writing, and how is he ever to do this without studying the dictionary or the Expositor?' We answer, in a variety of ways. First, *indirectly*, by studying things. Let him learn scientific terms by attending to popular treatises of the sciences themselves. Let him learn the other terms used in conversation or books, by inquiry of those he converses with, or by reading, with a dictionary at hand for reference. The teacher who cares for the good of his pupils, will direct such a course and see that it is followed; while he who studies his own ease will direct the child or the class to commit a page of words for one evening's work, and set one of his large boys to hear it recited in the morning.

The meaning of words may be learned by a direct process, which should never supersede the indirect one, already recommended, but which may very properly take the place of the 'Expositor' system. This is the learning of a foreign language. Nothing excites attention to the precise meaning of words in the vernacular language so effectually as the study of a foreign one, no matter whether it be a dead or a living language. This is the shortest and the most direct way to correct knowledge of the meaning of English words and an accurate English

style. Let no parent or teacher say that this would occupy too much time, while it is a fact, a dead certainty, that one fifth of the time usually spent on the 'Expositors,' where those books are used, would give a sufficient knowledge of French to enable a child to read without a dictionary, and a sufficient knowledge of Latin to translate with facility with a dictionary.

Happily for the present age the study of Latin is simplified so as no longer to require the toil of years before a Roman author can be read; and French is brought to every man's door in the shape of a book for self-instruction. Ignorant teachers will raise an outcry against such an innovation as the substitution of a foreign language for the Expositors; and parents will be cajoled with such arguments as the following;—

'Fine times truly! Things have come to a pretty pass! Here are children learning French and Latin, who don't understand their own language. For my part I think it best to have a good English education before one troubles one's head about foreign languages. This parade of learning is all nonsense. I do not believe in learning French and Latin before one is *perfect* in one's English. No, no, the Expositor for my money. It is is time enough to think of foreign languages when a child knows the meaning of all the words in our own.'

It is a sufficient answer to all this to say, that by learning a foreign language, one becomes acquainted with the structure of language, with the principles of etymology and definition, and the general relation of thought to expression; and thus acquires a key to the meaning of words in the vernacular tongue, which the committing of Johnson's folio dictionary, with all the references, to memory, would not furnish.

'But what shall we do for instructers in foreign languages?' the parents will inquire. Make it a requisition for your teacher to know Latin or French and you will soon have a supply. While there are such books as Bolmar's Perrin, and his edition of Telemaque, and Walker's New Latin Reader—books which furnish the means of learning either language in the evenings of a winter, by any adult of common sense—country teachers will not choose to remain ignorant of these languages. If the present generation of schoolmasters are too indolent to teach themselves these languages, let parents do their duty in making the requisition absolute; and successors will easily be found who will be ready to sacrifice their own ease to the welfare of the rising generation.

Central School of Arts and Manfactures, designed to form Civil Engineers, Directors of Mill Works, Heads of Manufactories, &c. &c. Authorised by his Ex. M. de Vatismenil, Master of Public Instruction. Founders, Messrs Laval.é, Director; Benoit, Dumas, Olivier amd Péclet, Professors.

(Continued from p. 275.)

Programs of the instruction of the Central School of Arts and Manufactures.

The instruction of the Central School of Arts and Manufactures is arranged conformably to the programs of which a list here follows:

Course of Geometry.
of Practical Natural Philosophy.
of Machines and Mechanic Arts.
of Chemistry and Chemical Arts.
of Analytic Chemistry.
of the Working of Mines.
of the Art of Building.
of Practical Natural History.
of Statistics and Political Economy.
Designs relative to all the courses.

Manipulations relative to the courses of Chemistry, Natural Philosophy, and Mechanics.

Course of Descriptive Geometry.

By M. Olivier—Former pupil of the Polytechnic School, Ex-Professor in the School of Application at Metz, &c. M. C. Adjunct Professor.

The professor, at the beginning of his course, will explain to the pupils the theory of logarithms, the use of the tables, and the elements of plane trigonometry.

The course of descriptive geometry will last one year.

In the first part of the course, the professor will endeavour to make the pupils familiar with the various modes of projections. To insure afterwards that they have a thorough knowledge of the elements of geometry of the three dimensions, and that they are able to make use with facility and intelligence, of the various graphic constructions of descriptive geometry, he will cause them to make applications to perspective and to shades. A certain number of these applications will be proposed as problems, and the solution of them performed without the aid of the professor.

In the second part of the course, the professor will develope the various applications of descriptive geometry:

1. To Stone-cutting;—2. to Carpentry;—3. to Mechanics;—4. to Astronomy.

In the applications to mechanics, he will show how one can, in certain cases, make good use of rigorous results, but obtained by difficult and long constructions, by results inexact it is true, but sufficient for practice, and preferable for the engineer, because they are obtained by an expeditious method.

Of the right line of the plane.

First construction.—1. *Question.* Through a point given in space, to draw a right line parallel to a given right line, and to find the magnitude of a part of this line.—2. Through a given point, to draw a plane parallel to a given plane.—3. To construct a plane which may pass through three points given in space.

Second construction.—4. Two planes being given, to find the projection of their intersection.—5. A right line and a plane being given, to find the projection of the point where the right line meets the plane.

Third construction.—6. Through a given point, to draw a perpendicular to a given plane, and to construct the projection of the point of meeting of the right line and the plane.—7. Through a given point to draw a right line at right angles to a given right line.—8. A plane being given, to find the angles which it forms with the planes of projection.

Fourth construction.—9. Two planes being given, to construct the angle which they form between them.—10. Two right lines which cut each other being given, to construct the included angle.—11. To construct the angle formed by a right line and a plane, given as to position in space.

Fifth construction.—12. Two right lines being given in space, to determine the position and magnitude of the line which measures their shortest distance.

Of plane tangents, and of normals to curved surfaces.

Sixth construction.—13. To draw a plane tangent to a cylindrical surface;—1. Through a point taken in the surface;—2. Through a point taken without the surface;—3. Parallel to a given right line.

Seventh construction.—14. To draw a plane tangent to a conical surface;—1. Through a point taken in the surface;—2. Through a point taken without the surface;—3. Parallel to a given right line.

Eighth construction.—15. Through a point taken in a surface of revolution, of which the meridian is known, to draw a plane tangent to that surface.—16. Through a point taken in the sheet hyperboloid, to draw a plane tangent to that surface.—

17. Through a point taken upon the hyperbolic paraboloid, to draw a plane tangent to that surface.

Ninth construction.—18. Through a point taken in a regular surface, to draw a plane tangent to this surface;—application, 1, to the conoid;—2, to the helicoid, [surface of the thread of a screw.]

Of the intersection of surfaces.

Tenth construction.—To construct the section of a right cylinder, through a plane perpendicular to one of the planes of projection.—To draw the tangent to the curve of intersection, to make the development of the cylindrical surface, and to refer to it the curve of intersection as well as its tangent.

Eleventh construction.—To construct the intersection of a cone; 1, right; 2, oblique, through a plane perpendicular to one of the planes of projection; development and tangent.

Twelfth construction.—To construct the intersection of a surface of revolution through a plane, and the tangent to the curve of intersection; application, 1, to the ellipsoid; 2, to the sheet hyperboloid.

Thirteenth construction.—To construct the right section of a cylinder, to draw the tangent, and to construct the development.

Fourteenth construction.—To construct the intersection,—1, of two cylindrical surfaces,—2, of two conical surfaces,—3, of a cylindrical surface and a conical surface,—4, of two surfaces of revolution whose axes meet,—5, of a conical surface and a surface of revolution.

Application to the solution of certain problems.

Fifteenth construction.—Four points being given in space, to find a fifth which may be at equal distances from each of them, that is, to circumscribe a sphere about a pyramid.—Four planes being given, to find a point which may be at equal distances from each of them, or to find a sphere tangent to four given planes.

Sixteenth construction.—In a solid angle of three faces, there exist three rectilinear angles formed by the edges among themselves, and three diedral angles formed by the mutual inclinations of the faces. Of these nine angles, three being given, to find the others.

Seventeenth construction.—To draw to a helix traced upon a right cylinder a tangent parallel to a given plane.—Through a given point upon a spherical epicycloid, to draw a tangent to this curve.

Eighteenth construction.—Through a given right line to draw a plane tangent to a sphere.

Nineteenth construction.—Through a given right line to draw a plane tangent to a surface of revolution;—1, to the ellipsoid;—2, to the sheet hyperboloid.

Twentieth construction.—To construct a right line resting upon four given right lines.

Applications of descriptive geometry.

1. *To Linear Perspective.*—General notions upon perspective and upon the apparent outlines of bodies. The pupils will execute various constructions.

2. *To Shades.*—General notions upon shades. The pupils will execute numerous constructions of shade.

Wash.—The pupils will wash for effect, under the direction of the professor of design, some of the drawings in shade which they shall have executed.

3. *To Stone-cutting.*—1. *Construction.* Curve slope, *in bevel,* presenting a cylindrical scoop.—2. Curve slope in a round tower, *in bevel,* and presenting a spherical scoop.—3. Turned slope, or cow's horn (two solutions).—4. Back vault of Marseilles.—5. Long gothic-arch vault, and cloister-arch vault.—6. Right descent.—7. Sloping descent (two solutions).—8. Trumpet slope in the angle.—9. Ridge-arch vault in a round turn.—10. Winding stair-case, open for light, and with solid newels.

4. *To Carpentry.*—1. *Construction.* Right ridge;—2. Oblique ridge;—3. Inclined span;—4. Winding staircase. The pupils will have to trace a certain number of combinations pointed out by the professor.

5. *To Machinery.*—Tracing of gearings and of curves described by moveable points in machines, &c. &c.

6. *To Astronomy.*—Projection of solar dials.

Course of Geometry of three dimensions.

The professor will give, during the course of descriptive geometry, numerous lessons, in which he will determine, *by geometry,* the principal properties of conic sections and of surfaces of the second order, and those of transcendental curves, and of surfaces of superior orders, which find their application in the arts.

Course of Topography.

Elementary notions of Topography.

The pupils will execute in the field, surveys with the plain table, the compass, the surveyor's square, and will besides be exercised in levelling.

At the commencement of each lesson, the professor will question a certain number of the pupils; the adjunct professor will moreover have two interrogatories a week. At the end of each year the pupils will undergo a general examination.

Course of Natural Philosophy.

By M. Périet—Former pupil of the Normal School, Master of Conferences in the Preparatory School, Ex-Professor of Natu-

ral Philosophy at Marseilles, &c. M. Caladon, Adjunct Professor.

The course of Natural Philosophy is divided into two parts, corresponding to the two years of studies. The first part includes the physical properties of solids, liquids, and gases, at rest or in motion; the second, those of the imponderable fluids. The first part will comprehend all the facts of rational mechanics, which are important in applications. The most of them will only be enunciated, since the mathematical knowledge possessed by the pupils will be insufficient to enable them to comprehend their demonstration. But the manner of applying them will be enlarged upon. In this part of the course much development will be given to the theory of the resistance of solid bodies at rest or in motion, in liquids and gases, and to that of friction. In the second part, the theory of heat will principally be enlarged upon.

Although this course of natural philosophy is chiefly directed towards useful applications, the plan comprehends all classes of physical phenomena; but a great number will be examined only in a very succinct manner. This arrangement has the advantage of uniting among themselves the different parts of natural philosophy, of facilitating their study, and of imprinting the facts on the memory; advantages which would not be attained by treating merely of the physical phenomena which have useful applications to the arts. Besides, if the pupils ought not to study certain theories, they ought to know of their existence, in order that they may labour under no illusion in relation to the difference which exists between the part of the science which they have studied, and the science considered in all its developments.

First Year.

General properties of bodies.—Extension, measure of extension; system of measurement; guaging; different instruments; impenetrability; divisibility; atoms; mobility; different kinds of forces; time; units of time; instruments for the measure of time; velocity; inertia; measure of forces; composition of forces which act upon the same point; equilibrium of a material point; motion of a material point, free or required to rest upon a curve or a surface.

Permanent forces which act upon bodies.—Gravitation; weight; general phenomena; centre of gravity; law of weight both above and below the surface of the earth; law of the fall of a body at a small distance from the earth; intensity of weight at the surface of the earth; apparatus designed to measure the bulk of bodies, balance, steelyard, bent lever balance.

Molecular attraction.

Repulsive force of heat.

Of solid bodies.—Porosity; density, different methods of determining it; phenomena which result from the greater or less stability of the equilibrium between the particles of solid bodies. Elasticity; ductility; frangibility; resistance to the stroke; resistance to pressure; resistance to traction; resistance to being worn or used; structure of solid bodies; equilibrium of solid bodies; motion of a free solid body; motion of a solid body around a point, a right line, or upon a surface; friction; laws; tables; shock of bodies, solid, soft, and elastic; use of solid bodies to transmit motions.

Of liquid bodies.—Porosity; density; areometer of Baume, of Cartier; alcoometer, volumeter; areometer giving the densities; phenomena which result from the greater or less stability of equilibrium between the particles of liquid bodies; compressibility; elasticity; viscosity; cohesion; equilibrium of liquid bodies; principles upon which the laws of the equilibrium of liquids are founded; equilibrium of liquids subjected to whatever forces, equilibrium of liquids enclosed in vessels of large dimensions; lateral pressure; equilibrium of liquids in capillary spaces; equilibrium of floating bodies; motion of liquids; motion in open canals; motion in conduit pipes; flowing through orifices in very thin partitions, through pipes; shock of liquids against solid bodies; motion of floating bodies; use of liquids for transmitting and modifying forces; use of liquids as moving forces.

Of gaseous bodies.—Atmosphere; general properties of the gases; measure of the elastic force of the gases; barometers; law of Mariote; density of the gases; bodies floating in gas; motions of gaseous bodies; motions in conduit tubes; flowing through orifices in their partitions, and through pipes; shock of the gases against solid bodies; machines and apparatus, the play of which is founded upon the properties of the air; use of the gases in transmitting and modifying forces; of the wind as a moving force; of air, considered as the vehicle of sound.

Second Year.

Of heat.—Sensible caloric; radiated caloric; laws of radiation; influence of surfaces; equilibrium of temperature by exchange; propagation of heat through bodies; laws of the diminution and increase of heat; latent caloric; expansion of bodies; vapor; hygrometry; specific caloric; phenomena developed in the changes of state of bodies; measure of temperatures; sources of heat; sources of cold.

Fuel.—Combustibles employed for fuel; calorific powers in weight and volume; radiating powers; motion of hot air in conduit pipes; laws of the motions in having no regard to friction; laws deduced from observation; influence of superior and infe-

rior partitions; of the curvature of pipes; of lateral openings; effect produced by the meeting of currents.

Of chimneys.—Elements which determine their dimensions; law of the cooling of the air in chimneys; determination of the minimum diameter of a chimney; the most favorable dispositions for augmenting the draft; construction of shop and house chimneys; influence of the state of the atmosphere upon the draft of chimneys; apparatus designed to secure the draft of chimneys from the influence of the winds.

Steam Boilers, apparatus of supply, apparatus for safety, furnaces, hearths, grates, pipes of circulation, chimneys, registers, form of the different apparatus in use.

Simple distillation, by an open fire, in the open air, with pressure, by steam; rapid distillation; distillation with analysis of vapors; double distillation.

Spontaneous evaporation; by a current of forced air; by fire in open vessels; by hot air; by steam and by baths of hot oil; double apparatus; evaporation in the open air, spontaneous or by heat.

Drying in free air; by hot air; by contact with steam pipes; by a current of air put in motion and dried; drying of pulverised matters; drying in the open air.

Heating by the gases; ventilation of habitations; warming by combustion direct; internal warming by stoves; warming of the air by radiation; pipe stoves; hot air calorifers; steam calorifers; hot water calorifers; comparison of the different modes of warming.

Heating of liquids; direct heating; heating by steam.

Heating of solid bodies.

Cooling of bodies; ice houses; frigorific mixtures; ventilation by cold air.

Health apparatus for unhealthy factories.

Light.—Transmission; reflection; refraction; dispersion; coloring of light in passing through thin laminæ; inflection; double refraction; polarization; luminous meteors; vision; optical instruments; construction of lenses and mirrors.

Lighting.—Combustibles employed in lighting; examination of flame; lighting by solid materials; lighting by liquid materials; lamps, different forms of tubes, different arrangements of reservoirs of supply; hydrostatic lamps, mechanic lamps; lighting by gas; comparison of the different modes of lighting; apparatus for modifying lights; glasses ground or colored; reflectors; lens apparatus; lighthouses; flint and steel.

Electricity.—General phenomena; inequality of the conducting power of bodies; electricity developed by rubbing two bodies together is of a different nature in each of them; law of electrical attractions and repulsions; causes of the dispersion of

electricity; electricity is retained on the surface of bodies by the pressure of the air; relation of the spreading of electricity to the curvature of the surface; action of points; development of electricity by influence; explanation of the attractions and repulsions of electric bodies; explanation of the electric spark; electrical apparatus; electrical machines; electrophorus; condensers; electroscopes; effects produced by electrical explosions; electrical light; atmospheric electricity; causes of the electricity of the air; effect of thunder; lightning-rods, their construction; different causes of the development of electricity.

Electricity developed by contact.—Piles, different forms; effects owing to distribution; effects owing to currents; ignition and fusion of bodies; chemical effects; influence of currents upon the magnetized needle; action of currents upon one another; action of the earth upon moveable conductors traversed by currents; explanation of the action of currents upon loadstones, and of the former among themselves; development of electricity in chemical actions; application to the preservation of metals, and for preventing saline deposits in conduit pipes.

Magnetism.—General phenomena; poles; communication of the magnetic virtue; distribution of magnetism in a magnetised bar; terrestial magnetism; declination, compass; inclination, dipping needle; magnetic intensity, instrument to measure it; distribution of magnetism on the surface of the globe; variation of inclination, of declination, and of intensity; different processes of magnetizing.

Constructions.—The pupils will have to draw the following constructions:

Balances 1; lightning rods 2; shop chimneys 2; apparatus for steam 4; apparatus for distillation 4; apparatus for evaporation 4; driers 2; gas warmers 6; warming by liquids 2; warming by solids 1; ice-houses 1; apparatus for health 4; lighting 2. Total 35.

Manipulations.—In order to facilitate the understanding of the facts or of the phenomena studied in the course of natural philosophy, the pupils will be required to execute numerous experiments. The pupils will be required to erect large apparatus calculated by them with given conditions. They will subject them to various trials, in order to verify their calculations.

During the continuance of this course, the professor will question the pupils at the end of the lesson. The adjunct professor will have, besides, two interrogatories a week. At the close of each year there will be a general examination.

Course of Practical Mechanics.

By M. Bénoit—Civil Engineer, former pupil of the Polytechnic School, Ex-Professor in the School of Application of the royal corps of the army list, &c. M. Didiez, Adjunct Professor.

The instruction in mechanics has been divided into two grand sections. The one comprehends all the lessons of the first year, and a portion of those of the second; and embraces the study of theoretical mechanics, that of the elementary mechanisms of machines, and that in fine of the moving forces of the auxiliary machines of most mechanic arts. The other section of the course is reserved to the study of the arts, which, in order to make the materials upon which they are exercised undergo the necessary operations, make use of particular machines more or less complicated. In this part will be found much apparatus described in the first; but then it will be sufficient to point out their use, and the modifications of form and dimensions which they must undergo, for any particular object proposed. Notwithstanding these frequent and inevitable repetitions, it has been thought that the pupils will acquire a precise idea of practical mechanics, only in proportion as they shall be furnished with precise instructions upon a great number of mill-works, in such manner as to familiarize them, on every occasion, with the use of the known apparatus.

First Year.—First Section.

Equilibrium and play of simple machines.—Inclined plane; wedge; levers; pulleys; pulley blocks; windlasses; capstans; screw.

Resistance of the materials employed in the construction of machines.—Resistance of wood, of cast iron, of wrought iron, of steel, of copper, of lead, of pewter, of zinc, of chains, of cordage, of bands, of straps of leather, &c. To traction; to bruising; to bending; to transverse rupture; to interior pressure; to torsion; to the shock; to friction; to wear, &c. Measure of adhesion, of friction, and of the rubbing of cords. Influence of these resistances in conditions of equilibrium, and upon the motion of simple machines

Transformation of motions.—Elementary mechanisms, by the aid of which the different kinds of motion may be converted into each other:—Rectilinear progressive; rectilinear alternate; circular progressive; circular alternate;—whether these motions are subject to intermissions, or act with continuity.

For the purpose of rendering the constructions relative to these mechanisms more useful, care will be taken to preserve in the latter the appearance and the destination which they have in the machines from which they may be taken.

Of active moving powers.—Of the measure of dynamic effect in general. Of forces; of the law of forces; of the *metrolitre.* Measure of the dynamic effect possessed by the turning shaft of a receiver.—*Bridle, dynamometer, dynamometric balances.* Measure of the dynamic effect consumed by the labor of whatever

machine. Dynamometrical cord. Of man applied to a crank; to a peg wheel; to a drum; to tread wheels; to trenching and digging down; to carrying; to drawing. Of horses and oxen applied to drawing in teams and in carriages; or acting by their weight upon inclined planes and oblique moveable circles. Of springs and of heavy bodies considered as depositories of mechanical powers. Of *fly wheels* considered as regulators of the motion of machines.

Removal of loads.—Jacks; crabs; cranes; capstans; windlasses; rowel machines; drags.

Exertion of pressure.—Wedge presses; cylinder presses; screw presses; percussion presses; lever presses; hydraulic presses.

Exertion of percussion.—Rammers.

Elevation of water.—Bucket wheel; drum; *(noria)*; chain pump; screw of Archimedes; centrifugal force machine; machine of Verra; machine of Vialon; hydraulic reed; forcing pumps; suction pumps; forcing and suction pumps; bellows pumps; rotatory pumps; fire engines.

Displacement of gases.—Blowing machines; air pumps; bellows; ventilators; trumpets.

Weights and measures.—Balance, steelyard, lever-balance; calculator; perambulator; watches; clocks; timepieces.

Second Year.

Continuation of the First Section.

Of Water as a moving force.—Measure of the velocity, expenditure and force of currents of water; undershot wheels with plane floatboards hanging, moved by impulsion; undershot wheels with plane floatboards inclined, moved by impulsion; undershot wheels with curved floatboards inclined, moved by pressure; breast wheels with paddles and with buckets; overshot wheels with buckets; oblique wheel; shell wheel; spiral wheel; reaction wheel; tub wheels; *(Danaïde)*; chain wheel; buckets; float machine; machine of Schemnitz; water-column machine; hydraulic balance wheel; hydraulic ram; hydraulic regulators.

Of the terrestrial atmosphere as a moving force.—Of the velocity and force of winds; vanes with horizontal axis; windmills with fixed and with moveable sails; vanes with a vertical axis, and of their use as moderators in machines; of atmospheric air dilated in the pyrealophorus.

Of steam as a moving force.—Generation of steam; of boilers, and of the means of preventing their explosion; measure of the mechanic power of steam; of condensing engines; single acting steam engines; double acting steam engines, at high pressure with condenser; double acting steam engine, by expansion without condenser; double acting steam engine, by expansion

with condenser; of steam engines of many cylinders; of rotative steam engines; of moderators of steam engines; distributors of combustibles.

Particular applications of steam engines.—Of draining; of desiccation; of transportation upon iron rail-roads, by the aid of locomotive and fixed engines; of transportation by water, by the aid of steam boats and of engines for towing.

Of the gases and of vapors in general as moving forces.—Of the gases of powder in detonating machines, as fire-arms, mines, &c. Of the use of steam for throwing projectors. Brief history of steam engines.

Second Section.

Agriculture.—Ploughs, sowing machines, weeders, smoothing roller, machines for breaking down, straw-cutter, &c.

Millery.—Seives, fans; water mills on land and upon boats; steam mills; windmills; mills turned by animal power; by hand; bolts, kneading troughs, &c.

Lees, paste, vermicelli.—Grater, serge, rollers, drawing machine.

Wines, ciders, perry.—Presses, grinding mills, &c.

Oils.—Machines for pounding and bruising, for wringing, presses, &c.

Sugars.—Root-cutters, rollers, presses, &c.

Brick-making.—Machines for fabricating bricks, tiles, &c.

Rope-making.—Machines for fabricating and laying ropes, &c.

Spinning of hemp.—Systems of numbering the thread composed of filamentary substances in general; machines for peeling, bruising, combing, spinning and twisting, reeling and winding, hemp and flax.

Cotton-spinning.—Machines for beating, picking, carding, roping, spinning and twisting, reeling and winding, cotton.

Spinning of raw wool.—Machines for breaking, picking, carding, spinning and twisting, reeling and winding, raw wool.

Spinning of combed wool.—Machines for combing, plaiting, spinning and twisting, reeling and winding, combed wool.

Spinning of cashmere.—Machines for combing, carding, plaiting, spinning, twisting, reeling and winding, the cashmere.

Silk spinning.—Machines for drawing, twisting, joining, reeling and winding, of silk.

Fabrication of webs.—Machines for warping, sizing, and weaving, of plain, quilted, diapered, and figured stuffs.

Stocking weaving.—Machines for stockings and for various knit webs.

Fabrication of laces.—Machines for flat and round laces, &c.

Net-work.—Machines for making nettings, tooth-lace, tulles, &c.

Fabrication of felts.—Saddle-bows, fullers, machines for shaving the fur from the skins.

Cloth dressing.—Scourers, squeezers, dash-wheels, fulling-mills, nappers, shearing machines, brushers, tenter bars, stretchers, presses, calenders, cylinders, &c.

Impressions.—Machines for engraving on plane and cylindrical surfaces; machines for printing by application and in relief; copperplate presses; printing presses, mechanical compositor; lithographic presses.

Fabrication of papers and pasteboard.—Grinding mills, cylinders, twisters, moulds without end, &c.

Imitations.—Pantograph, prosograph; instruments for designing perspective; telegraphs, semaphorus.

Sawing.—Machines for sawing wood, for pointing stakes, for sawing stone, marble, &c.

Polishing.—Machines for polishing glass, optical glasses, &c.

Pulverisation.—Machines for bruising plaster; bark mill; madder mill; powder mills; mills for pulverising bones, for grinding ores; machines for braying.

Planing.—Machines for planing woods for painting, for raising mouldings, for making inlaid floors.

Fabrication of metals.—Trip-hammers, sledges, hammers, rolling and slitting mills, foundries, shears, wire-drawers.

Use of the metals.—Machines for fabricating nails, pins, needles, metallic cloths, lead pipes without seam; machine for cutting files; machine for making the Vaucanson chain.

Card making.—Machines for smoothing the leather, for pricking, for bending, and for setting.

Machine making.—Turning lathes; machines for planing, boring, fluting, and filleting; platforms for dividing and cutting gearings; (*alésoirs*); whetstones; carving tools.

During the course of Mechanics, the professor will question the pupils after each lesson; the adjunct professor will have, on his part, two interrogatories a week. At the close of each year, there will be a general examination.

The pupils will have at their disposal a certain number of machines which they will have to put up and take down, to operate, and to submit to such trials as will enable them to estimate their useful effect. They will execute in general all the experiments necessary for learning what modifications must be given to the results of theoretical mechanics, for the purpose of rendering them usefully applicable to the construction and establishment of machines.

Meetings will be propcsed to the students for accomplishing them in the application of the notions which they have acquired, relative to the composition or modification of machines, and to

the organization of mill works and manufactures, according to given programs.

Constructions and labelled sketches.—We state neither the number nor the nature of the constructions and labelled sketches relative to the course of practical mechanics, because the pupils ought to be able to design all the machines described to them. These machines will be studied so much the more in detail, as their utility shall be greater, or their use more extensive. The pupils will always have to execute at least a hundred and sixty designs relative to this course.

Course of Chemistry and Chemical Arts.

By M. Dumas.—Private tutor at the Polytechnic School, Professor at the Atheneum, &c. M. Bergouhnioux, Adjunct Professor.

Chemistry, as a science, offers a field so vast and so varied, it presents in its applications, details so numerous and so important, that it is thought necessary to point out the general march of this instruction, in order to show in what sense it has appeared necessary to direct it, for the purpose of preserving to it all its severity without making it lose its extent.

The first year is devoted to general chemistry. The useful bodies alone are studied, but these are studied under all points of view, and serve to justify or to demonstrate the general rules of the science. The pupils are called to repeat all the experiments, even those which require instruments of precision. For this purpose, they are provided with balances; they make themselves graduated tubes, &c.

The second year is reserved to the chemical arts. An attempt has been made to class them under a determinate order by their mutual dependence; but little importance is attached to this order. That which fixes above all the range of study of these arts is, the progress of the other courses of the school. The arrangement is to give examination to these arts in proportion as the pupils receive in the other courses the knowledge of which they have need, or indeed in proportion as the knowledge of these arts becomes useful to them in regard to their other studies.

The instruction of chemistry and the chemical arts is divided into four parts; 1, lessons of theoretical chemistry; 2, lessons relative to practical chemistry; 3, manipulations performed by the pupils; 4, designs of apparatus or mills, laid down by them after certain models, or composed at the meetings from their notes.

First Year,

General Chemistry.

Definition of chemistry; nomenclature; examination of simple bodies not metallic; proportional numbers, atomic theory; study of the forces which determine chemical phenomena; natural clas-

sification of bodies; study of compounds not metallic, divided into neutral, acid, and basic compounds; examination of the metals; compounds formed by the metals among themselves, or alloys; metallic oxides, chlorides, iodides, sulphurets, &c.; salts; recapitulation of the preceding lessons, comparison of bodies among themselves, under the relation of their differences or of their resemblances, and demonstration of the natural affinities of each group; analysis of gaseous compounds or mixtures; analysis of liquid and solid compounds or mixtures; general notions of organic chemistry; elementary analysis of organised bodies; general classification of bodies into acids, alkalis and neutrals; organic acids; organic alkalis; sugar, gum, starch, wood; alcohols and ethers; fat bodies; coloring matters; essential oils; resins; animal substances; recapitulation of the course, comparison of organic substances among themselves, demonstration of the relations which have served as the basis to their classification; general process of organic analysis; means of separating organic matters from each other; methods for separating from them the mineral substances which are mingled or combined with them.

Second Year,

Chemical Arts.

1. *General notions.*—Combustibles, heating, lighting; use of water, dissolutions, crystallizations, washing; mineral waters both natural and artificial.

2. *Chemical products.*—Extraction of sulphur and its purification; fabrication of sulphuric acid; extraction of marine salt; fabrication of the sulphate of soda; of artificial soda; of the soda called natural; fabrication of crystals of soda, of the salt of soda; preparation of hydrochloric acid; of chloride in quantities; of chloride of lime; fabrication of potash; of saltpetre; of gun-powder; of nitric acid; of alum; of the sulphates; of magnesia, copper, iron, &c.; fabrication of glacial sulphuric acid; products of the distillation of animal substances; animal carbon; hydrochlorate of ammonia; fabrication of Prussian blue, and of the prussiates.

3. *Matters for cementing.*—Making of plaster; of raw and hydraulic lime, of mortars, cements and grubstone mortar; essay on building stones.

4. *Potteries.*—Making of bricks; of crucibles; of tiles, square bricks, &c.; of crockery; of pipe-clay; of stone ware; of porcelain; application of colors in the various classes of pottery; preparation of these colours.

5. *Glasses.*—Making of bottle-glass; of common glass with potash base; of common glass with soda base; of crystal; of strass; of enamels; application of colours in the various kinds of glass; preparation of these colours; colouring of vitreous bodies in the mass; painting on glass.

6. *Working of the metals.*—General principles of metallurgy; extraction of bismuth; of tin; of zinc; of antimony; of lead; of copper; of mercury; of silver; of gold; of platina; of iron; of casting and its varieties; of steel and its varieties; general considerations upon the influence which the mode of treating iron ores, their nature, and that of the combustibles, exercise on the quality and the quantity of the product; general notions on the making of alloys in quantities; bronzes; brasses; printing types, &c.; refining of the precious metals; application of metals upon metals; art of gilding; silver plating; tinning of copper and iron; metallic mohair; tinning of glasses; gilding of woods, of skins, of papers, &c.

7. *Vinegar and products which depend thereon.*—Making of vinegar by fermentation; by the distillation of wood; making of verdigris; of verditer; of the acetate of lead; of Dutch white lead; of the white lead of Clichy.

8. *Of sugar and of the products analogous.*—Making of sugar from red beets; of starch; making of wine, of cream of tartar, and of tartaric acid; making of beer; of cider; extraction of alcohol and of brandies, of rum, &c.

9. *Of fat bodies and of their products.*—Extraction of oils, tallows, &c.; making of candles, wax lights, &c.; making of soaps.

10. *Colours and dyes.*—General processes of dying; properties of materials to be dyed; hemp or linen, cotton, wool, silk, and leather; bleaching of linen and cotton; discharging of the oil and grease from wool; discharging the grease from silk; dying red; yellow; blue; black; mixed colours; application of the process of dying to various matters, under their various forms; impressions upon linen and woollen cloths.

11. *Of the graphic arts, under a chemical point of view.*—Colours employed in oil painting; in miniature; in water colours; in chalks; in pastels; fabrication of paper hangings; preparation of the colours in use in the graphic arts; general processes of printing; of engraving in black; of engraving in colour; of lithography; fabrication of pasteboard and of various sorts of paper.

12. *Various arts.*—Extraction of the essential oils, preparation of varnishes; art of tanning; hat making; preparation of gelatine and of glues; manufucture of tobacco.

Manipulations.—Each week, the pupils will be set to repeat themselves the experiments made in the lessons. They will have besides special lessons for learning to blow glass and making all the instruments of the laboratory.

Moreover, the pupils will construct themselves certain apparatus of fabrication on a large scale, and will make them operate. They will be introduced into factories, in order to study the various kinds of industry which are the object of the course.

In the particular design of the school, it has been thought indispensable to multiply the manipulations: thus they will be four times more numerous than those of the polytechnic school.

Constructions.—The pupils will have to execute the following constructions.

Apparatus for general chemistry	4	of mercury	1
Making of charcoal from wood	1	of silver	2
Preparation of gas for lighting	2	of gold	2
Preparation of artificial mineral waters	2	of platina	1
		of iron	10
Extraction and purification of sulphur	1	Fabrication of steel	2
		of mould casting	2
Making of sulphuric acid	2	of bronze	1
Extraction of marine salt	4	of brass	1
Preparation of sulphate of soda	1	Refining of the precious metals	1
of artificial soda	2	Making of tin-plate	1
of natural soda	1	Art of gilding	1
of the salt and crystals of soda	1	Tinning of glasses	1
of hydrochloric acid	1	Making of acetic acid	1
of chlorine and the chloride of lime	1	of verditer	1
of potash	2	of white lead	1
of saltpetre	1	of sugar from canes	2
of gunpowder	3	of sugar from beets	4
of nitric acid	1	Refining of sugar	4
of alum	1	Making of starch	1
of glacial sulphuric acid	1	Preparation of wine	1
of plaster	1	of beer	1
of limes, mortars or cements	2	of cider	1
of bricks	1	of spirits	4
of tiles or square bricks	1	of oils	1
of crucibles	1	of tallow	1
of crockery	1	Making of candles	2
of pipe clay	2	of wax lights	2
of stone ware	2	of soaps	4
of porcelain	2	Apparatus for dying	10
of bottle glass	1	for printing upon stuffs	9
of window glass	1	for making paper hangings	6
of crystal	2	Making of paper	4
of enamels	1	Extract of essential oils	1
of strass	1	Tanning	4
Painting upon glass	1	Hat-making	2
Extraction of bismuth	1	Distillation of animal matters	1
of tin	1	Prussian blue and prussiate	1
of zinc	1	Gelatine and glue	2
of antimony	1	Manufacture of tobacco	2
of lead	4		—
of copper	2		161

During the whole of the course, the pupils will be examined by the professors at the end of each lesson. The adjunct professor will have two interrogatories a week. At the end of each year, there will be, besides, a general examination upon the whole course.

Course of Analytic Chemistry.

By M. Bussy, former Pupil of the Polytechnic School, Professor at the School of Pharmacy.—M. Bergouhnioux Adjunct Professor.

First Year.

When the pupils shall be sufficiently advanced, materials will be given them to analyse. The composition of these materials being known by the professor alone, the pupils will give their results, and marks will be assigned to each of them, according as they shall have more or less approached the truth. These lessons, which will take place in the latter part of the course, will have particularly for their object the study of the general principles of chemical, mineral, and organic analysis.

Second Year.

The different methods of analysis, easily applicable to the wants of industry and commerce, will be explained. The pupils will be required to execute all the experiments necessary to the understanding of the processes employed in the chemical arts, all the trials by which the value of the products in use in these arts can be fixed, in fine to make the complete analysis of the various materials of important use. These processes of analysis and the manipulations which relate to them, will be arranged in such a manner as to present in one single group all that has relation to the operations of the same industry.

Course of Working the Mines.

By M. Bineau, former Pupil of the Polytechnic School, Engineer of Mines.

In this course the various species of minerals will be made known, the appearances in which they are found in the bosom of the earth, and the means that may be made use of, in order to extract and work them.

It will be divided into two parts. The first will include the principles of mineralogy and geology, and the general methods of working. The second will comprehend the complete study of the species employed in the arts, their mineralogical characters, their direction, and the mode of working which is proper to them.

First Part.

1. *Mineralogy*.—Notions of crystallography; determination of the species of minerals; scientific classifications; enumeration of the species, their summary description; 2. *Geology*.—Of rocks, and of their structure; stratification of grounds; successive appearances of organised beings in the different geological stages; division of grounds into different classes; enumeration of the grounds in the order of superposition; theories upon the formation of the earth. 3. *Working*.—1. Search of mines; cuts, pits, and galleries, sounding; search of subterraneous waters, artesian wells.—2. Means of making trenchings, utensils, and powder. —3. Working in open air.—4. Working by pits, and galleries; veins, beds, and masses.—5. Timbering; resistance of woods; timbering of pits in quick sands, and grounds penetrated with water; timbering of galleries.—6. Walling, strengthening with

plank in curb. 7. Transportation of the ores in the interior of the mines; the raising of them out. 8. General principles of the mechanical preparation of ores.

Second Part.

Description of all the mineral species employed in the arts; their position, their extraction, their uses. Examples will be given drawn from mines the most celebrated and best worked. 1. Stones employed in jewelry; means of cutting, of polishing them, of estimating their value. 2. Polishable rocks; stones employed in constructions. 3. Minerals which are used in making glass, porcelain, crockery, potter's ware, and bricks; minerals which are employed as solvents in the metallurgic arts. 4. Mineral materials employed as manures in agriculture; minerals made use of in design and painting. 6. Metalliferous ores; the mechanica preparation of them. 7. Combustibles, anthracite, lignites, bitumens, and turf.

Constructions.—The pupils will have to execute the following constructions 1. Crystallographic figures; general geological section; details of this section relative to the grounds which contain the principal metalliferous locations, the combustibles, and the saliferous masses; particular sections proper for making known the manner of existence of veins, masses and deposits. 3. Design of boring and of its different utensils. 4. Sections representing the various modes of working. 5. Designs relative to the timbering and walling of galleries and pits; model of toothing and of picketing. 6. Disposition of an iron railway in the interior of a mine. 7. Tubs and cars which raise the ore out. 8. Machines for braying; grinding mill, cylinder machine; machines for washing, *(patouillet)*, stationary trough, rocking trough, rocking sieve. 10. Cutting of precious stones; cutting of gun flints.

During the whole course the pupils will be questioned by the professor at the end of each lesson. At the end of the year, there will be, besides, a general examination upon the whole of the lessons.

Course of Practical Natural History.

By M. Ad. Brongniart.—Doctor of Medicine, Fellow of the Faculty of Paris, &c.

This course will have for its end, to make known all the organized beings, which, by themselves or by any of the substances which they produce, are employed in the arts of industry.

They will examine the characters which distinguish these beings, their origin, the diverse varieties important to be known which they present, the cares which they require, their mode of culture or of bringing up. When only one part of these beings is used in the arts, the organization of that part will be studied in such manner as to give an account of the mode of formation

of the useful substance, and of the means by which its quantities may be augmented, or its qualities perfected; in fine, the endeavour will be to determine what are the processes by which these substances may be obtained in the most economical manner possible.

This course will comprise two parts, wholly distinct; the one will have for its object, vegetables and their products; the other, the animals, and the materials they furnish.

First Part. *Of Vegetables.*

Organization and intimate structure of vegetables, functions of these beings, and mode of formation of the various substances which they contain. Of their culture in general.

Classification, distribution by natural families, characters and properties of the most remarkable families.—Special history of the vegetables and vegetable substances employed in the arts.—Wood considered in regard to constructions, to the fabrication of machines and instruments, to heating, and to carbonization; textile materials, and those suitable for making paper; starchy substances; gums; substances containing sugar and alcohol; oils, vegetable wax, &c.; tobacco; resin, resinous gum, caoutchouc, &c.; tanning matters; alcaliferous substances, opium, quinine, ipecacuanha, &c.; preservation of vegetable matters.

Part Second. *Of Animals.*

Organization and functions of animals.—Of the various substances which compose them, and of their mode of formation.—Classification of animals and comparative organization of the principal classes.—Special history of the animals and animal substances employed in the arts.—Animals considered under the relation of their mechanical action.

Animal Products.

Hair, wools, horse-hair, &c.; feathers, down, &c.; silk; peltries and furs; skins, parchment; catgut; animal glues; greases, white and whale's; wax; honey; colouring matters; cochineal, kermes, lake, sepia, &c.; preservation of animal matters.

Constructions.

Constructions.—The pupils will be exercised in copying designs representing the points the most important to be known, of the organization of vegetables and animals, or the characters and structure of the substances employed in the arts.

At the end of the course, all the pupils will be examined by the professor, who will, in addition, during the course, hold many examinations, in order to ascertain the progress of the pupils.

Course of the Art of Building.

By M. Goublier.—Architect of Public Works, Recording and Corresponding Secretary to the Council of Civil Edifices.

The object of the course is,—1, to procure for the pupils a general knowledge of the art of arranging, executing, and valuing the constructions, which the exercise of the different indus-

tries may render necessary; 2, and to serve as preparatory studies for those who are specially designed for the exercise of the art of building, whether as architects or civil engineers, or as builders or undertakers of building.

As these last must necessarily study more particularly the different objects of this course in a third year, the professor will give to each of these objects those developments only which are useful to the great body of the pupils.

This course will be divided into several parts, of which this is an index:—1. Of the materials which are employed in constructions.—2. Of the preparations which they undergo.—3. Of the various parts of constructions.—4. Of the laws of edifices.—5. Of the manner of reckoning, measuring, and estimating constructions.—6. Of the arrangement of constructions.—7. Of the execution of works.

1. *Of the materials which are employed in constructions.*—§ 1. Materials taken from the vegetable kingdom.—Wood; thatch, reeds, &c.—§ 2. Materials drawn from the mineral kingdom.—Minerals, earths, sands, pebbles, puzzolanas, plaster, buhrstone, rubblestone, stones, freestone, granite, marbles, slates, &c. Metals—iron, copper, zinc, lead, pewter. In regard to these different matters, their physical and chemical qualities will first be described, so far as particularly concerns the art of building, according to what has been taught in the course of mineralogy, natural history, natural philosophy, and chemistry; these will be given besides an introductory sketch of their principal uses.

2. *Of the preparations which these materials undergo.*—§ 1. Before being delivered to builders. 1. Operations merely manual or mechanical.—Cutting and sale of woods; extraction of earths, sands, minerals, and metals. 2. Operations, manual and mechanical as well as chemical.—Making of bricks, tiles, and paving bricks; of artificial puzzolanas; of plaster, and of lime. For all these operations the course will be confined, as far as possible, to rehearsing succinctly what has been taught in the courses of descriptive geometry, chemistry, mechanics, &c.

3. *Of the various parts of constructions.*—§ 1. Of the foundations.—1. of the knowledge of the various species of soil.—2. Of the means of remedying their compressibility.—3. Of the execution of the labours of removing and filling up.—4. Of the execution of the foundations.—5. Of terrace-walls, or walls of support.—6. Of cellar vaults.—§ 2. Of constructions above ground.—1. Of vertical constructions in wood, in pisé, in masonries of rubblestone, buhrstone, bricks, stone, &c.—2. Of horizontal constructions, areas, pavements, brick pavements, slabbing, &c.—Floors of wood, of wrought or cast iron. Terraces in stone, bitumen, metal, &c.—§ 3. Of the various species of roofs, as well in relation to their disposition, as to their construction, their spreading, &c.—§ 4. Of shelters.—1. Of ridge-

roofs of wood, of iron wrought or cast.—Of shelters properly so called, in thatch or reeds, in wood, tiles, slates, metal, &c.—§ 5. Of stairs in wood, in masonry, &c.—§ 6. Of preparatory works. Scaffoldings, arch-moulds, props, shoars, &c.—§ 7. Of the use of iron for contributing to the solidity of constructions in wood and masonry.—§ 8. Of accessary works.—Joinery, locksmithery, painting, glazing, &c.—§ 9. Of hydraulic constructions.—Of canals, basins, reservoirs, aqueducts, wells, and in particular of artesion wells.—§ 10. Of bridges of wood; of iron; of masonry. Of bridges suspended by iron chains.

4. *Of the laws of edifices.*—§ 1. As to what concerns the relations with the public authority.—Of the laws, regulations or usages, relative to the working of various materials, and to the various fabrications of which they are susceptible.—To the laying out upon the public way, to the conditions required in regard to the solidity of constructions, to their height, &c.—To the conditions relating to rivers and water courses.

§ 2. As to what concerns the relations with individuals. Of services; of the right of enclosure; of the laws of vicinage; of partition walls; of prospect upon neighbouring property; of the distances on vacant spaces which may be exacted in certain cases; of what relates to waters and to plantations; of the guaranty of constructions; of reparations of tenants; of leases and rights of occupancy, reports of reviewers, and arbiters, &c.

5. *Of the manner of reckoning, measuring, and valuing constructions.*—Of works which may be reckoned by the piece; of those which may be estimated whether by linear measure, or by the surface, or by solid contents; of the principles of measurement, and of different usages which are more or less generally admitted in it; of valuing, and of the fixing of prices; of the digesting of plans and memoirs.

6. *Of the distribution of constructions.*—Of the preliminary digestion of a program pointing out the destination of the constructions, the various parts of which they are to be composed, the disposition and size which they must have, the number of individuals or of various objects which they must be able to contain; and in general of the various data which it is necessary to satisfy. Of the general principles which should be followed in the disposition of constructions, as well to satisfy the data of the program, as to obtain all necessary solidity and all possible economy.

Of the execution of the works.—Of the various modes of execution.—By superintendence according to the expense in labourers' days' works, and materials.—At the lowest price by the piece or by measure.—By contract or by the job.—At established prices.—Of the advantages and disadvantages of these different modes of execution.—Of the measure proper to be taken in order to secure these advantages, and to prevent or diminish these disadvantages.—Of the clear, entire, and precise determination (in

case of prices fixed in advance, or of bargains by the job,) of the works to be executed, by means, 1. of plans, sections and elevations in sufficient number; 2 of a schedule of description and estimation; 3 and by a bill of the expenses of the execution.—Of the direction, conduct and superintendence of works.—Of the contestation, as the execution goes on, of works which do not remain apparent or accessible.—Of the examination, verification, allowance and estimation of works, after their accomplishment. The pupils will have to execute the following constructions: Machine for making mortar, 1.—Combination of carpentry, forms of out-houses, wooden fronts, floors, roofs, scaffoldings, arch-moulds, stair-cases, &c., 14.—Floors and roofs of iron, 5.—Vaults, arches, bridges, stone stairs, 10.—Ground plans, sections, and elevations of factories, 10.—Total, 40.

Course of Political Economy and Statistics.

By M. H. Guillemot.

Political economy may be considered under various points of view, and taught by many methods, according as it is proposed to form publicists, legislators, administrators, merchants, or manufacturers.

The end, wholly special, assigned to the studies in the central school of arts and manufactures, excludes the transcendental theories, and comports only with teaching doctrines immediately applicable, and above all controversy. Such is also the predominant idea of the course of political economy and statistics, and the basis of the plan which the professor proposes to follow.

This plan, conceived according to the very order of the successive development of the operations of industry, admits three principal divisions, under which all the subjects of instruction arrange themselves.—The conception and establishment of a manufacture.—2. The working of it.—3. The sale of the manufactured products.

First Division.

Elements of the general theory of industry.—Property of industry.—Laws instituted to guarantee or to modify it. Legislation of writs of invention, of patents, of establishments of industry considered as inconvenient, unhealthy, or dangerous.—Of capitals, and of their functions in the production of riches.—Of association and its effects.—General view of the various modes of societies of industry. Analysis of the circumstances which ought to influence the mode of working, and the choice of place for establishing a manufacture.

Second Division.

Division of labour, its principles and effects.—Nature and functions of the various agents of production.—Of workmen, of workmanship, and of salaries.—Laws upon the relations of masters and workmen, combinations, police of industry, &c.—Institutions of head-men (*prud' hommes*).—Of machines.—Of the

buildings and of the moveables of industry.—Of the funds for carrying on.—Principles of accountability in industries.

Third Division.

Circulation of products.—Functions of the various agents which distribute them in society.—Of the taking price and of the sale value.—Analysis of the elements of both.—Channels of disposal.—Various causes which determine their relative advantages.—Tariff laws.—Prohibitions.—Protective rights; import duties, and excise on manufactured articles.—Drawbacks and premiums.

Without making the subject of a particular instruction, statistics will be constantly appealed to, in order to give to the general principles the irrefutable sanction of facts. Numerous documents drawn from the best sources, will be put into the hands of the students, from which they will be frequently exercised in drawing up computations, in making comparative calculations, and even in digesting memoirs upon various questions of political economy and statistics. The last lessons will be devoted to making known to them, by rapid views, the history and the comparative actual situation of the principal industries among different people, and the causes of their progress or of their decline.

Constructions.

For the purpose of engraving in the minds of the students the most positive and most important results of this course, they will be made to put into synoptical tables certain of the data of the statistics of France. There will be given them to colour, according to various indications relative to industry, maps of France disposed for this purpose. The pupils will best represent to themselves thus the distribution of combustibles, mines and great industries, upon the soil, which sooner or later they are to operate.

Course of Design.

By M. Leblanc.—Professor of Design to the Royal Conservatory of Arts and Trades.

From their entrance into the school, the pupils will be employed in executing certain designs with the scale and dividers. They will be taught the various processes of washing, there will be given to them certain models for chalking and taking proofs, in order to help them to the use of this convenient and expeditious process; in fine, they will be exercised in sketching certain outlines from models, at first, and then from the machines, all the means being pointed out to them which permit of preserving, in this kind of rapid design, the vigour which seems particularly proper to finished designs.

The professor will inspect during the whole year the labors of the pupils; he will pass in the halls of study a part of the time devoted by the pupils to their graphic labors, Tuesday, Thursday, and Saturday, during the three first months.

The designs finished by the pupils will be revised by the professor. The marks given for these designs will enter into the general account of the pupils.

Accessory Lessons.

The adjunct professor will, during the first month of the year, give lessons of elementary mathematics, designed for the pupils whose preparatory studies shall have been too small. These lessons will take place in the evening, in one of the amphitheatres of the school.

There will be in the school a joiner's and a woodturner's shop, and one of a mounter and a turner in metals. Workmen will labor there the whole year under the eyes of the pupils, whether in constructing models for the collections of the school, or in making the pieces of machines ordered by the pupils in their exercises, or, in fine, in giving the pupils certain notions upon the handling of tools, the use of the forge, &c.

The pupils will moreover receive lessons carried through by a skilful blower of glass; in each laboratory an enameller's lamp will be placed at their disposal, in order that they may execute themselves, in their manipulations, all the parts of apparatus which can be done by them, and that they may replace those which shall come to be broken in the course of their experiments.

Complementary Courses of the Third Year.

Independently of the labors of which we have spoken, the pupils who shall design to become civil engineers, will follow, in the third year of study, courses of the differential and integral calculus, and of analytic mechanics, which shall complete their theoretic knowledge. M. Benoit will be charged with the course of analytic mechanics.

Education for Officers of the Navy.

[The following observations are extracted from Jones' 'Sketches of Naval Life.' They present some of the most important arguments for the establishment of a Naval School; and, we think, merit the attention of those to whom the most important interests of the nation are intrusted.]

'Until about ten years since, there were no examinations, and nothing was required for promotion to a lieutenancy, except the want of such an officer, and the belief that the candidate was a fit subject for it. At that time an order was issued from the Department that no one should be promoted till he had passed a satisfactory examination before a board of officers appointed for that purpose. There was no specified times for these examinations; but they usually came at the end of sev-

en years service as midshipman, and were soon followed by promotion. I am informed that they have done wonders for the Navy. A few months since another order, a very judicious one, reached us from the Department. The examination will now take place at the end of five years from the date of the appointment, three of which must have been spent at sea, in active duties: they are then to be styled "passed midshipmen," and with their pay increased six dollars and a ration, (or $13 50,) they are candidates for promotion, which will usually take place at the expiration of two years. He who fails in two examinations, will be struck from the Navy list.

'All this is very good, but more is needed, and it will be felt before many years, if it is not seen. I discard the question of expediency, usually the topic, when the Naval School is brought up, and I say it is a duty we owe the country, and a duty becoming every day more imperative. Look at our land, and mark its interests rising as those of no land ever rose before, and look at those interests, spreading, interweaving themselves with the politics of every nation on the globe, and every day becoming more complicated and important: then look at our young officers, and think that when they grow up, and become the heads of our Navy, those interests will be committed to their care, requiring in each Captain, not only a well skilled commander but a wise and able statesman, and then tell me is it not pitiful to confine their studies to Bowditch's Navigator. I say *confine* their studies; for when you throw them upon the world, without opportunities of studying more, and require only this, you do in effect confine them to it: and not half of them have an opportunity of making themselves acquainted with this. Let us examine this book, the one put as a text-book into their hands, and used in their examination, and therefore placed before them as the great perfection of a navigator's knowledge. It is an excellent *practical* work, and does not pretend to more than this; but it is intended chiefly for captains of merchantmen, and he who uses it, wanders blindfolded through its labyrinths; for there is little attempt at explanation, except what is absolutely necessary. A little Geometry at the beginning, and an exhibition of the principles of the sailings, so blind that no officer, I have yet met with, could understand from it the two last and most important,—this is the book, the height of our officers' attainments, who, when they have finished it cannot even tell why they count half degrees for whole ones from their sextants at the meridian observation. It may be answered that this matters little, so long as they count the degrees aright. Sentiments like this have been avowed even on the floor of Congress, and it has been hinted too, that it matters little how ignorant they are, as long as they fight our battles well. Tell it not in Gath! or rather tell it to the world, and let it be said too, that we blushed then and did justice to this ornament of our nation and to ourselves. Let the voice of the Navy itself be heard. I know not what the older officers think on the subject, but I do know that among the rest the cry is universal for a Naval School, and that they feel keenly the preference shewn our army in the cherished and favorite institution of West Point. I have seen them, three successive winters, turn eagerly to the subject in the Secretary's reports and among the debates of Congress; and I have watched the merited burst of indignation at the petty schemes agitated in that body, and the illiberal remarks by which they were upheld. But let not Con-

gress take alarm, and fear a mutiny in the Navy; a Navy never yet proved treacherous to its country. Our best officers may be court-martialed for breaking the laws of nations, though they are allowed no means of studying national laws; and they may be compelled to go into foreign employ to escape from censures at home: Congress may talk about hiring our younger ones out to merchantmen and saving a few dollars by it: they may talk about retrenchment and economy, till speeches and days accumulate and the golden streams of the treasury flow largely on themselves; they may say all things illiberal, and I can assure them that the Navy will not complain. *But I hope the Nation will*: and it ought to. For, as I have already said, our interests abroad are daily becoming more important, and these interests must be committed to our Naval commanders. The duties of such an officer are indeed remarkably trying. In every port which he enters, he is as much the representative of our nation as is the Minister at its court, and all the high qualities of such a man, and often more than these are requisite in him. He is often called on to make treaties; to decide controversies involving probably the interests of a large portion of our merchants; he must penetrate artful schemes; must unravel and oppose the intrigues of cabinets; must in great and small matters support the honor of his country, and must often in these things act suddenly, yet with decision. A Minister has the advantage of residing among the people with whom he has to do, and can watch and study the progress of events. But a Naval Captain cannot. He enters a harbour, and a doubtful case is presented to him on which he has perhaps immediately to decide, and he must then adhere to his decision. If the nation supports him, it may perhaps be led into serious difficulty; if it does not, he must be censured, and probably a valuable and meritorious officer will be lost. How much is committed to the discretion of such a man. Which of these things is to be done by the army? I ask you which? Or what is to be done that will compare in importance with them? And yet we build for the army a liberal institution, and its praises are abroad in the land. Do not mistake me. I wish not to decry the establishment at West Point. It is a noble and useful one: it is honorable to the nation, and justly a favorite; but I mean to build on it some arguments for giving the Navy a similar one. Our army does not appear abroad: its officers are unknown there: foreign nations scarcely know that we have an army: but our Naval officers are every where, and every where affect most seriously the interests of our country. It is true that they have done much for these interests, but let it not be hinted that it was owing to the want of culture in those who did it. The slander has been said, and shame to them by whom it was uttered. But if it were true, the past is no rule for the future: our nation is changing its features every day, and what was admissible in the infancy of our Navy, may be ruinous in its manhood. This has already in some degree manifested itself. "Quantum periculum sit * * suspicari de præterito quam re ipsa experiri est melius,"* is a maxim useful as well for governments as for individuals.

'I will add a few more particular considerations. I have hinted at the early age in which officers are sent aboard ship, and have often

'* (It is better to suspect the magnitude of the danger, from the past, than to bring it to the test of present experience.)'

regretted it. Yet it is an evil not to be avoided in the present system. The term of Midshipman lasts seven years; that of Lieutenant about fifteen; that of Master Commandant five, six, or seven, according to the necessity for higher officers. The last two of these terms will perhaps increase according to the increase of officers in our peace establishment; but at least twenty six years will have to pass from the date of their warrant before they can become Post-Captains, at present our highest rank. This is a long time, and accordingly they enter as young as possible. The consequence is, that if the lad is smart and agreeable, he becomes a favorite on board, is petted and spoiled. I omit to notice the vices that never fail to come under his observation. It is cruelty and worse to throw striplings among such scenes; to feed their pride with power over others, while to them discipline is relaxed; to give them up to the shining temptations of the gambling table; to make them familiar, with crime, before they suspect it is near them. It is making the nation a pander to vice, and the nation's rulers will have to answer for it. We boast of our schools, and our extensive distribution of knowledge; and those states are most applauded, which lay the surest foundation for a wise population; and all this is just. But why neglect most those who are the nation's charge, its adopted children, given up to it by their parents;—nay, worse than neglect them, give them a premium for ignorance, and bring them up so; and then look to them for honour. We have been too long in error. Let the nation extend a fostering care to those so early in life entrusted to it; let it inform their minds, and place a corslet over their hearts; teach them to consider their destined business as a science, as well as a trade; learn them to find resources in books; to think and reason; to feel at ease in society, and enjoy it, and the tavern and billiard room will cease to be their resort.

'But I would not have the institution I speak of only a school for lads: it would not meet half the necessities of the case. It should be on a liberal scale, like the one at West Point, and a spot around which our officers of all ranks, when at home, would gather for information and improvement. It is usual to give them leave of absence for several months, after a cruise like ours: sometimes this is extended to the period of a year or more: their first visit will of course be to their friends, and then, I have no hesitation in saying, half of them would turn to their Naval College, as the most agreeable way of spending time.* The benefit of all this would soon return upon the nation: our officers would not have to resort to the tedious, unsatisfactory, and often treacherous medium of interpreters, in their official transactions abroad. General science would be greatly promoted, and what to them would be of greater benefit, science in Naval matters would make a rapid advance. We are constructing docks; our dangerous coasts are not half surveyed; and the ten thousand complicated parts of ships, ship stores, and appurtenances are open to improvement. No one will say that in these, or any one of them, there is no room for improvement.

'* There have been four Naval officers attending the lectures, as much as circumstances would allow, in Yale College this winter; and I know of more who would have done it, if they could have found time. Of the Midshipmen in the Constitution, while I was on board, one had been a resident, while holding a warrant, at West Point, and three at Partridge's school.'

The very fact that improvements in the Navy have not kept pace with those on shore, would lead one to suspect that there is much room for improvement, and I do not hesitate to say that there is.

'I should say nothing about the expenses of such an institution, if economy were not such a favorite topic in our halls of legislation. Economy! As if a nation's happiness and prosperity consisted in having her coffers filled, and not in the well being, and intelligence, and enterprize of her citizens. Who would barter mental wealth for gold? Or who would refuse it for his sons for the sake of gold? Yes there are some but they are the selfish, the illiberal, the churlish; and they generally end with being the *contemptible.*

'I will only add, that till Congress provides a college for the Navy on a liberal and generous scale, it will be doing it a crying injustice.' pp. 63—70.

FROM THE ALBANY ARGUS.

Extract from a pamphlet upon the establishments for Public Education in Bavaria, Wirtemberg, and Baden.

The kingdom of Wirtemberg appeared to the author as one of the most generally civilized in Europe. Elementary education is universally diffused. All can read and write. The political condition of the inhabitants is also highly favourable, as almost every father of a family is a landed proprietor.

The following are some of the existing regulations concerning education in Wirtemberg:

1. There is an institution or college, in the vicinity of Stuttgard, for the instruction of school teachers. Here they are examined after passing through the required studies, and no one is permitted to take charge even of the most common school, unless he has a proper certificate. There is also an institution for instructing female teachers, in which are taught the ordinary branches of science, with needle-work and the art of cookery.

2. In every village or hamlet there is a school, and the master who directs it, has, as part of his salary, a house with a small garden annexed to it. Government fixes the amount of his salary, which is paid, if necessary, by a tax on the district. In large towns or cities, the number of schools is of course increased, according to the number of the population.

3. A law is in force requiring every child to be sent to these schools, females from the age of six to that of thirteen, and males from six to fifteen. If the parents can afford to pay the whole or part of the tuition, they are required to do so, otherwise the district.

4. The branches required by law to be taught, are reading and writing, grammar, arithmetic, and geography. Biography and history are also read.

5. In every district the clergy of all denominations act as superintendents or trustees over the schools. Religious instruction forms no part of the school education. This is intrusted to the respective clergymen, in consequence of the variety of sects to which the children belong.

6. All the children are annually examined before the above trustees, and whoever have remained the required time, and are found qualified, receive a certificate of the same. *Without this certificate*, no person under the age of 21 is allowed to be employed throughout the kingdom.

In Bavaria, a system of education greatly resembling that of Wirtemberg is pursued. Mr Hazzi, an enlightened patriot has composed a catechism of Agriculture, and has had influence enough with the government to induce them to order its introduction into all the schools. The science is also practically cultivated.

Every school has some two or three acres of land annexed to it, in which the scholars act as labourers—sowing various kinds of seeds—noticing the varieties of culture—and the phenomenon of vegetable physiology. A small garden spot is reserved for the female children to raise flowers.

Baden is no less favoured than the other countries in the general diffusion of elementary schools. Female instruction is particularly attended to. The elder scholars in the Female Academy at Carlsruhe study natural history, (and in particular botany,) astronomy, geography, the French and German languages, music and dancing.

Every traveller in Germany, notices the prevailing passion in that country for music, and the high perfection attained in it by multitudes of the population.

NOTICES.

Encyclopædia Americana : A Popular Dictionary of Arts, Sciences, Literature, History, and Politics, brought down to the present time, on the basis of the Seventh Edition of the German Conversations-Lexicon : And including a copious collection of original articles in American Biography. Edited by Dr. Francis Lieber, assisted by Edward Wigglesworth, Esq.—Philadelphia. Carey, Lee & Carey. Boston. Carter & Hendee, Agents for New England. Vol. 1. 8mo. pp. 616

The first volume of this very valuable work has just issued from the press.

From the Editor's Preface we extract the following account of it, and shall probably notice the work more at length in a subsequent number.

'In presenting this work to the public in the English language, my intention has been, by making such changes and additions as the circumstances of this country required, to render it as useful and acceptable to the general reader here as the

original is in Germany; and I have cherished the hope, that the circumstance of its being an *American* encyclopedia, not merely in name, but as constituting an extensive repository of information relating to America, as well as to the various branches of general knowledge, would give it a peculiar value with that great European nation, whose language and literature are the common property of themselves and their descendants in the United States.

'In the title page, this work is stated to be formed upon the basis of the German *Conversations-Lexicon;* and if the reader will compare it with the original, and consider the numerous additions and corrections which have been made, I hope he will not find cause to charge this title with being too pretending. My idea of a good American encyclopædia has been, that it should contain, besides the most valuable portions of the English encyclopædias, and the topics of peculiar value to an American reader, information upon all subjects of general interest on the continent of Europe. The publishers have, with great liberality, supplied all the means and facilities which were desired by the editor. The trustees of the Boston Athenæum have obligingly allowed free access to their ample library, which does so much honor to the metropolis of New England. But, above all, I ought to acknowledge the zealous and able co-operation of my friend and associate, Mr. Wigglesworth, who will not permit me here to express my obligations to him in such terms as my feelings would dictate. With him I shall be happy to share whatever approbation the public may think the work shall deserve.

'Some of the departments of science and literature, which were but imperfectly treated in the original German work, have been entirely re-written for this edition; for example, Zoology (by Dr. Godman of Philadelphia, author of the well-known American Natural History), Mineralogy and Chemistry. The departments of Political Economy and Geography have also been much enlarged. Numerous entire articles of American and English law have been introduced, and large additions made to the original articles on Jurisprudence, which, in the German work, are mostly confined to subjects of Roman, German, and French law. In General Biography, large additions have been made. The articles on *American* Biography are entirely original, and have been furnished by Mr. Robert Walsh, Jr., whose learning and taste are a sufficient pledge of their value. Their apparently disproportionate length may, with a foreign reader, require some apology; but I persuade myself, that, with the American reader, the new and interesting information they contain will be deemed a sufficient reason for their not being further abridged. Such readers, too, will appreciate the value of many details of American history, which are not yet to be found, and could

hardly be entitled to a place, in a general work upon that subject. Besides the contributions of Mr. Walsh, many new and valuable articles have been written by distinguished American scholars, particularly in relation to their own country, and to other parts of the American continent. The biography of living citizens of the United States has, for obvious reasons, been omitted; but the reader will find an account of our most distinguished foreign contemporaries.'

Books for Children.

The Juvenile Miscellany.—Among the periodical publications for young persons which are particularly deserving of public confidence and patronage is the 'Juvenile Miscellany,' published once in two months by Putnam & Hunt of this city. It consists entirely of original matter from some of the most gifted among those who have devoted their talents to the improvement of youth. It is a very fascinating book for young folks; and to our certain knowledge many 'children of a larger growth' have condescended to find amusement and instruction in its pages. It contains stories both grave and gay—stories which contain their moral in them, instead of having it awkwardly appended to the conclusion—dialogues on life and morals; and on the various branches of physical science—sketches of natural history—biographical notices of distinguished men—translations from foreign juvenile works—and short pieces of poetry.

A publication of this sort could not fail to be popular if tolerably conducted; but sustained by some of the best writers in our country, and sustained too, with uniform spirit, it has become quite a standard periodical, a regular portion of the juvenile library. So long as it shall continue to be conducted with the same ability as heretofore, it will undoubtedly retain its popularity and continue to exert an immeasurable influence on the virtue and intelligence of the rising generation.

Biographical Sketches of Great and Good men. Designed for the Amusement and Instruction of Young Persons. Second Edition. Boston. Putnam & Hunt. 1829. 18mo. pp. 89.

These sketches are written by the gifted lady who conducts the Juvenile Miscellany, and have appeared at different times in that excellent work. They are very justly called 'Sketches,' as they present the most striking traits of certain distinguished individuals, and bear the same relation to regular works of biography that a pen sketch does to a finished portrait. They serve rather to awaken than to satisfy the curiosity of the young read-

er: and yet the anecdotes are so striking and piquant that they leave an impression which will seldom, if ever, be effaced, even when extensive subsequent reading has filled up the outline to which the mind's eye was early accustomed.

The Little Bird Teacher. Translated from the French.—Little Edward.—The Little Rogue.—John White and Albert Williams, or the Lapse of Twenty Years. A Tale. Boston. Putnam & Hunt, and Wait, Greene & Co. 1829. 18mo. pp. 16 each.

We are glad to see some of the most popular narratives contained in the Juvenile Miscellany selected and published separately, as it brings them within the reach of many little folks who cannot bear the expense of the entire work. The style of the stories before us, is plain and unambitious—well suited to the capacities of children; and the incidents are well chosen and natural. It is curious to observe how everything that relates to the subject of education is feeling the pervading influence of improvement. Formerly books of this class and price were sure to be most contemptible trash—trifles in which the *mind* of writer or reader could have very little concern. But now the urchin who denies himself an orange, for the sake of possessing a book, is pretty certain to get his penny's worth. As a natural consequent, that important portion of capital called pocket money has found a new channel and the march of juvenile mind a new direction.

Sketches of the Wallington Family. Boston Wait, Greene & Co. 1828. 18mo. pp. 73.

This is apparently the effort of a juvenile mind; but we have no hesitation in pronouncing it an uncommonly happy one. The descriptions are graphic, the conversations lively and natural, and the style not too colloquial nor too ambitious. If there be any deficiency it is in the management of the story, the most difficult part of invention and that in which many an experienced writer occasionally fails. The fine moral taste of this young writer and an evident talent for observation, afford a favourable presage of future success and usefulness.